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DECEMBER 1990

Saving the Rain Forests A Burning Problem

Plus:

Robots in Your Future

Pigs as Pets? You Bet!

The World's Longest Tunnel

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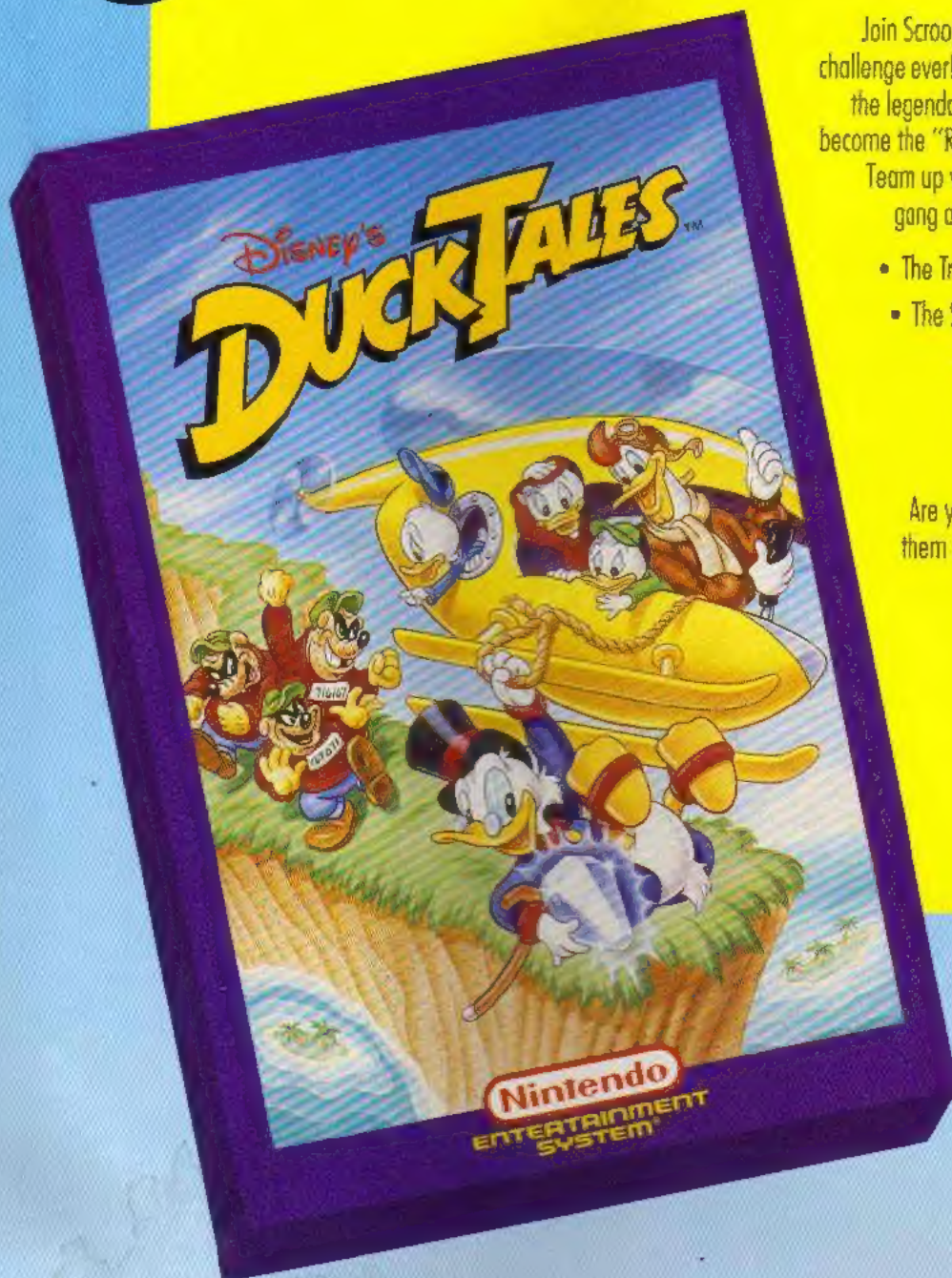
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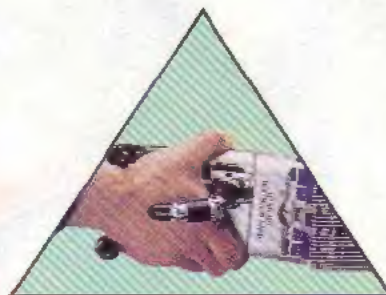
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ON OUR COVER

Rain forest photo: © Chip & Jill Isenhardt/
Tom Stack & Assoc. Photo of the Cover by
Stan Fellerman



Walking Zombies

Are you getting enough sleep? If you feel like you're starring in *The Night of the Living Dead*, chances are you need more zzz's.

According to sleep experts, most people need seven to nine hours of sleep each night. But nearly half of all Americans sleep at least 60 to 90 minutes less each night than they should. By the end of the week, that's like missing a full night of sleep!

And it now seems that people rob themselves of more than just a good night's sleep. In one study, sleep researchers discovered that when students spent one week getting to bed an hour earlier than usual, they scored higher on tests and felt happier.

If you need an alarm clock to wake up or if you constantly feel sleepy at school, you need to get more "shut-eye." Try sleeping an extra 30 to 90 minutes a night.

Sleep needs *do* vary. So if you don't need a lot, don't worry. It's nothing to lose sleep over!

Shinscrapers!

No. The Big Apple hasn't shrunk. It's the Panorama of New York City, the world's largest scale model of a city. Built in 1965 for the New York World's Fair, the model reproduces every building in the city—over 850,000 of them!

Since the city has changed a lot since 1965, the model is getting a face lift. Those who work on the model have to be extremely careful: One wrong step can destroy an entire city block—skyscrapers and all!

Jaws in Jeopardy

Sharks, those deadly dwellers of the deep, are now being hunted by even deadlier creatures—fishermen.

How come? More and more people in the U.S. like the taste of shark meat. So, this has caused a sharp rise in shark fishing. And the heavy fishing is now threatening the survival of some types of sharks in the Atlantic Ocean.

The most serious threat, though, is caused by finning—a practice in which fishermen kill the shark and then slice off its




PHOTO © BOB SLOAN

fins. (Shark fin soup is popular in Asia.) The rest of the shark is thrown back in the ocean.

Environmentalists are trying to take a big bite out of shark fishing and finning. This fall, the National Marine Fisheries Service limited the number of sharks that could be caught by fishermen in U.S. waters. This may keep the ocean's most dangerous fish out of troubled waters.



PHOTO © LUC NOVOTNY/HAMMA LIAISON




Space Race

There's going to be a space invasion in 1992. That's when a small fleet of solar-powered spaceships will begin a race to sail to Mars. The ships will be launched into orbit to celebrate the 500th anniversary of Columbus's voyage to America.

The unmanned spaceships are really huge aluminum sails—some of them are twice the size of a football field! And instead of burning fuel, they are pushed along by the pressure of sunlight on the sails.

Each solar sail is steered by an on-board computer that receives commands from the ground. It will take the "racing" vehicles two to five years to reach Mars.



Three space sails (one from Europe, where Columbus set off; one from Asia, where he was going; and one from America, where he ended up) will be chosen as "flagships." The ships will be named the *Nina*, *Pinta* and *Santa Maria*. Any guesses why?

PHOTO © TOM HAMES/WORLD SPACE FOUNDATION

Story suggested by
Adlai Griffith, Cedar Falls, IA.



So What's New?

You tell us and you'll get a nifty CONTACT T-shirt—if we print your story. Send us any science story from the news that you think our readers would like to know about. (Be sure to tell us your T-shirt size and where you heard the story.)

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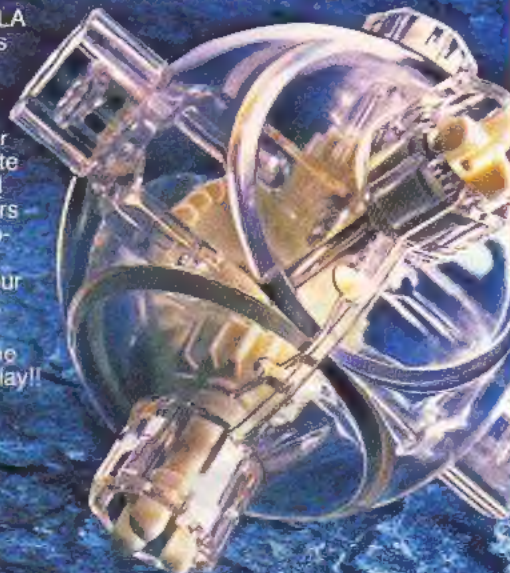
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ANY QUESTIONS?

By Christina Wilsdon

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DOES A TRAFFIC LIGHT KNOW WHEN TO CHANGE COLOR?

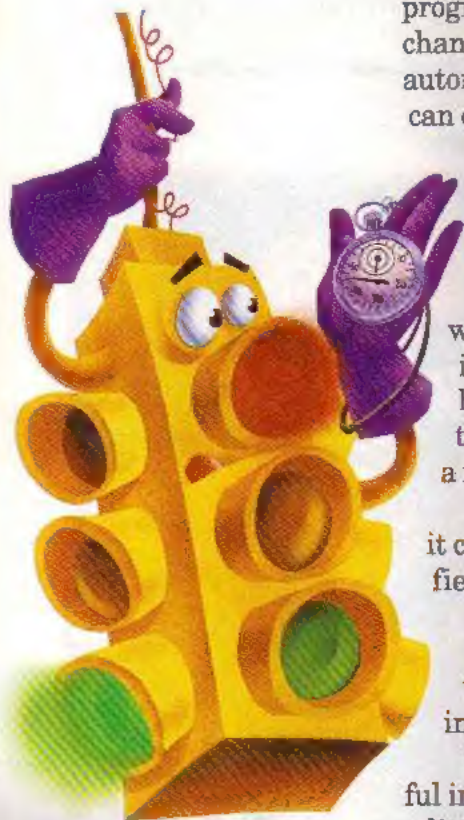
Some traffic lights are simply programmed by radio signals to change every few seconds or minutes automatically. But other traffic lights can detect waiting cars. So what gives?

The secret lies in the street under the car's front bumper. A long wire, attached to a control box, runs under the road. The wire loops under the road so that its other end leads back into the box. An electric current runs through the wire, which produces a magnetic field.

When a car stops over the wire, it causes a change in the magnetic field. This change sends a signal to the control box. Now the traffic-light control system "knows" that cars are waiting at the intersection.

This kind of system is very useful in places where a busy road meets a little-used road. The light will stay green for the busy road, instead of turning red every few minutes. Now *that's* getting the go-ahead!

Question sent in by Danielle Perry, San Jose, CA.



**D
O**

ANIMALS GET CAVITIES?

You'll probably never see a lion with a toothache in your dentist's office! Even though it *is* possible for animals to get cavities, it's unlikely.

Cavities are caused by bacteria that digest sugars and starches sticking to teeth. They release acids that break down tooth enamel.

Meat-eating animals don't have sugars and starches in their diet. Plus, gnawing on bones keeps their teeth clean. Plant-eaters have to chew long and hard to crush the tough fibers in their food. So their eating habits also prevent tooth decay.

Animals in the wild will quickly die if they have bad teeth. That's because they need teeth to defend themselves as well as to eat. Zoo animals, on the other hand, do get dental help. For example, some sea lions get a daily brushing with meat-flavored toothpaste!

Pets like dogs and cats are more likely to have tooth and gum problems, mainly because they eat a lot of soft food. They need crunchy pet food and rawhide bones to help keep their choppers gleaming.

Question sent in by Bethany Short, Jacksonville, FL.

DO CRICKETS ONLY CHIRP AT NIGHT?

Some people think crickets chirp at night just to keep them awake! Actually, not all crickets are quiet during the day.

House crickets — the kind most likely to sneak into your home — chirp night and day. Most tree crickets sing only at night, but tree crickets living in weeds or grass will also sing during the day. And it's only the male crickets that sing. Their "crooning" attracts female crickets.

Singing at night is probably safer for a cricket than singing during the day, when a bird might hear the song and eat the little chirper. (Most birds are not as active at night.)

Try locating a singing cricket at night. He'll stop chirping every time you move. But once you find him, he'll keep singing even if you're shining a flashlight on him. (Maybe he thinks it's a spotlight!)

Question sent in by Brian Kehoe, Troy, MI.



DO YOU CLOSE YOUR EYES WHEN YOU SNEEZE?

You don't have a choice! Your eyes close automatically when you sneeze. It's something you do without thinking — like blinking or breathing.

When you are about to sneeze, a nerve in your nose sends a message to your brain. Then, the brain sends a message to your eyelids. They slam shut and form an airtight shield over your eyes as you AH-CHOOOO!

It's a lucky thing that your eyes close, too. When you sneeze, you push a lot of air out of your body with great force — up to 100 miles per hour. If you kept your eyes open, you could strain the muscles that keep your eyes in place.

By closing your eyes, you also keep the germs from getting into your eyes. It's one way your eyes could become infected. And *that's* nothing to sneeze at!

Question sent in by Kelly Elsbury, Lake Charles, LA.



ILLUSTRATIONS BY VALERIE MARSELLA

Do you have a question
that no one seems able to answer?
Why not ask us? Write to:
Any Questions? 3-2-1
Contact, P.O. Box 40, Vernon,
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Paradise Lost

by Elizabeth Vitton

EARTH'S RAIN FORESTS ARE

ZAP! From below the surface, an archerfish blasts an unwary spider on a leaf with a bullet of water. The spider drops into the pool and is gobbled up. Downstream, a piglike tapir searches for food with its multi-purpose trunk. Above the jungle floor, a troop of monkeys chatters while birds streak by, their wings weaving a tapestry of brilliant colors.

Welcome to the rain forest, an exotic world where the air is thick mist, where fish walk on land, where passion flowers bloom and tree frogs sing. A place where the constant hum of thousands of animals fills the air.

But now the roar of the chain saw is drowning out the jungle chorus. "Each minute, 100 acres of the world's jungles are being cut and burned," says

The rosy periwinkle is more than just a pretty jungle plant. It is made into a drug to help treat leukemia.

PHOTO © JOHN KAPRIELIAN/PHOTO RESEARCHERS, INC.



PHOTO © CHIP & JILL ISENHART/TOM STACK & ASSOCIATES

▲
**Logging
companies
could strip many
rain forests of
tropical timber
in as few as
seven years.**

DISAPPEARING

Dr. Stuart Strahl of Wildlife Conservation International. "At this rate, nearly all the Earth's tropical rain forests will either be destroyed or seriously damaged by the year 2035."

Most rain forests are found in the tropics bordering either side of the equator, like a wide belt circling the Earth. Rain forests get an average of 100 to 400 inches of rain per year. The heavy rainfall may make the forest green, but it also washes away a lot of nutrients from the soil. Because of this, the shallow-rooted trees get most of their nourishment from leaves and dead materials that fall from above.

As they compete for sunlight, trees in the tropical forest grow to amazing heights—50 to 150 feet—before sprouting branches and leaves. Below

the tentlike canopy of trees grow palms, looping vines, orchids, ferns and other plants. Less than two percent of the sunlight that nourishes the canopy ever reaches the floor. But even there many plant and animal species thrive in a twilight world.

New species are being discovered all the time in the rain forest. Right now nearly two *million* species have been named. "And for every jungle species known, there remain 40 yet undiscovered," says Dr. Fred Kuntz. He is a mammal expert at the Bronx Zoo in New York. "We know more about distant planets than the nearest rain forest!"

Even though rain forests cover only six percent of the Earth, they are home to more than half of all living things on our planet. Scores of these plants and animals are now dying out. "Nearly 10,000 species are already being lost every year, never to be replaced," Dr. Kuntz told CONTACT. "Once a species is lost, it's gone forever."

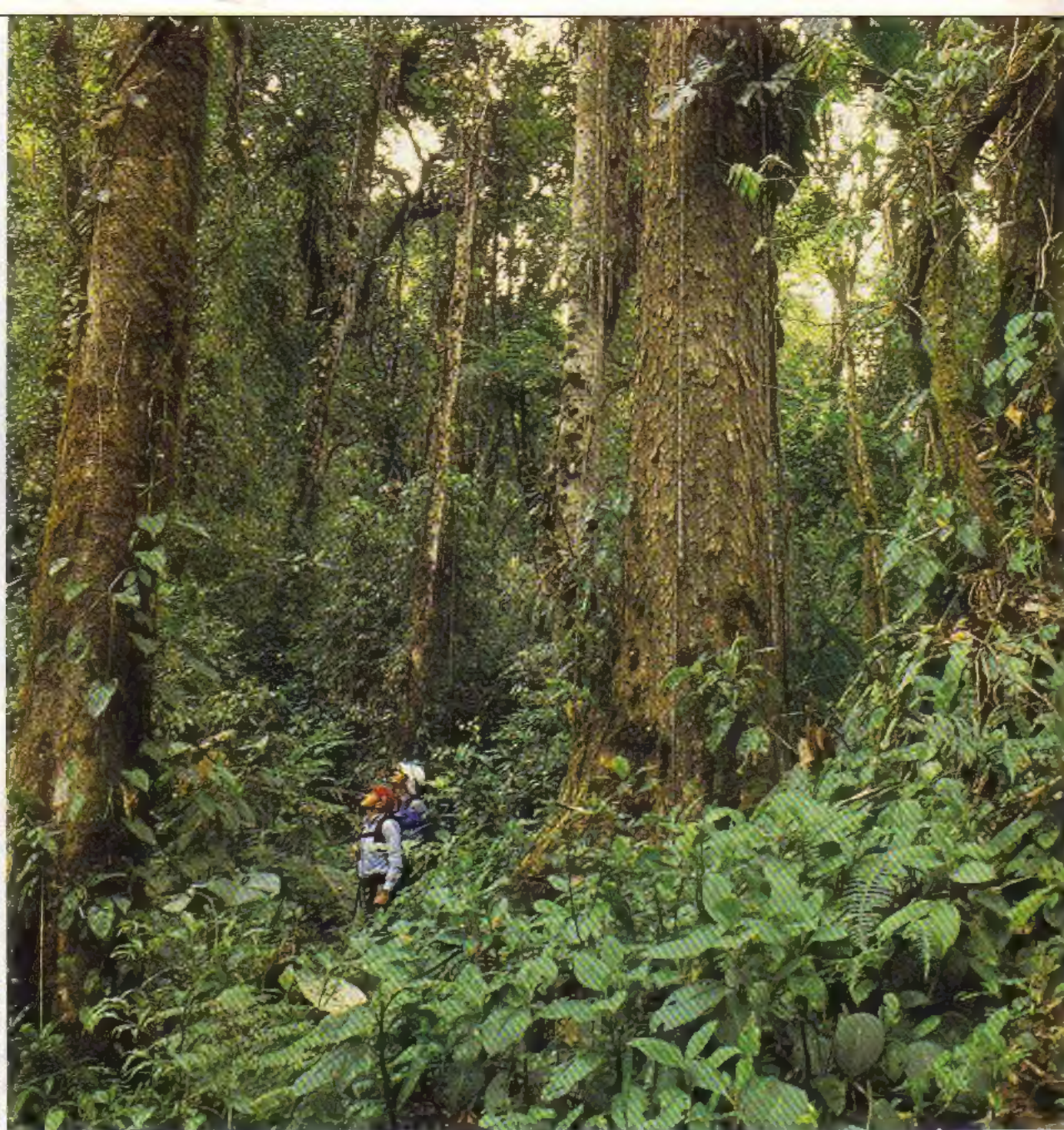
It's Not Easy Being Green

Why are we losing so much of our rain forests? Most of the tropical rain forests lie in poor nations whose populations are growing very quickly. Since they have no big industries, Dr. Strahl says, they make money by using the resources in the forest.

"It takes minutes for a chain saw to topple a seven-foot-wide tree, but it will take five centuries for another tree to grow to the same size," says Matthew Hatchwell. He works to help save the

It's a jungle out
there! These
"ant-size"
hikers walk on
the wild side of
a rain forest in
Costa Rica.

PHOTO © CHIP & JILL ISENHART/TOM STICK & ASSOC.



Earth's rain forests. The crashing timber destroys small trees lying in its path. Tractors flatten more forest when they drag the trunks to loading areas.

As roads are cut to get the logs to market, it opens up the area to a flood of people who burn parts of the jungle to make room for farms and ranches. The problem is that most of the nutrients are in the living trees—not in the topsoil. So if the forest is cut down and burned, there is a very thin layer of rich ash which can grow crops for a few years. But once the nutrients have been used up by the crops or been washed away by the warm rains, the land becomes almost worthless. "When the soil gives out," Hatchwell told CONTACT, "it forces farmers to clear more and more land."

Destroying rain forests as far away as Brazil and Indonesia has serious consequences for all of

us. For example, the world needs trees to recycle carbon dioxide (CO_2), an odorless gas. Rain forests are the "lungs" of the planet. They suck the CO_2 out of the atmosphere through their leaves. The trees then "breathe" oxygen back into the atmosphere and pump it with moisture that falls as rain.

But trees are about 50 percent carbon. If they are burned, the CO_2 trapped inside them is released. "It's a double whammy," explains Dr. Russell Mittermeier, a conservationist. "The burning itself releases huge amounts of CO_2 . And it reduces the trees available to absorb the gas."

Carbon dioxide is a "greenhouse" gas. Like a greenhouse, carbon dioxide lets the sun's incoming rays through, but blocks reflected rays from leaving the atmosphere. It traps the sun's heat. But

many scientists believe that too much carbon dioxide could cause the Earth to heat up. The "greenhouse effect" would do more than just cause the temperature to rise, says Dr. Strahl. "It would also affect winds, rainfall, sea levels and storms. We need rain forests to help control our climate."

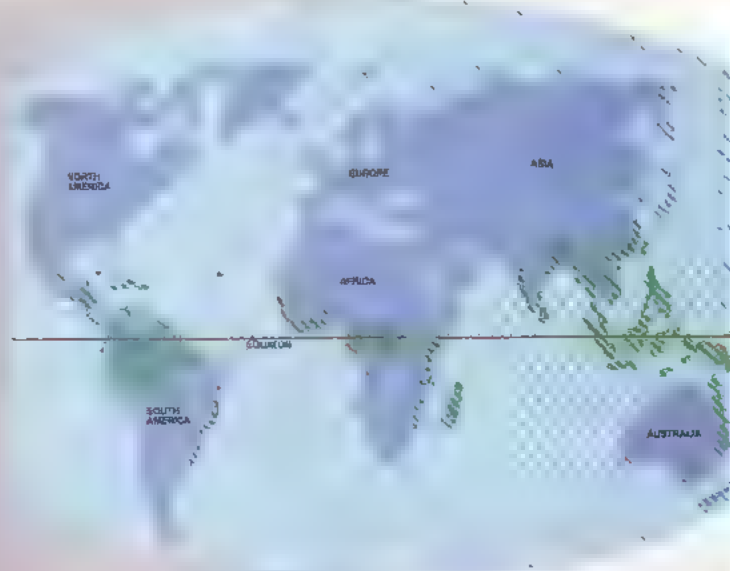
Food for Thought

Rain forests do more than help provide oxygen to the planet. They also help save lives in other ways, too. In fact, one-quarter of prescription drugs used in the U.S. come from tropical forest plants. Most plants, though, haven't been studied for ways to treat diseases. Says Dr. Mittermeier: "For all we know, solutions to health problems like cancer may exist in tropical forests."

Rain forests put medicine in your cabinet as well as food on your table. Each day people eat or drink something that comes from the jungle. Fruits, nuts, spices, coffee, sugar cane, cocoa and even chickens originated in rain forests. "Many are now grown elsewhere," Mittermeier says, "but if a pest attacks, a crop could be wiped out. So we have to be able to go back to the rain forest to crossbreed commercial crops with their relatives from the wild."

Rain forests also provide us with common work-day tools, such as burlap bags and rope nets. Fibers used for stuffing pillows and life jackets come from the jungle. So do the oils of many perfumes. Some jungle products have surprising uses, says Strahl. "Take M&Ms. The candy doesn't melt in your hand because they're coated with a harmless wax, which comes from tropical forests."

At least 27 million acres of rain forest are cut and burned every year. That means almost 74,000 acres each day are lost forever!



The world's tropical rain forests straddle both sides of the equator.

PHOTO BY RANDALL HYMAN

What's being done to save the globe's greatest natural treasury? Some poorer countries, like Costa Rica and Bolivia, have promised to protect their forests in exchange for lessening the money they owe to other nations. Others are setting aside nature reserves and planting new trees.

In Brazil, a rubber tappers' union is fighting for large areas to be set aside just for rubber production and the collection of fruits and nuts. In Malaysia, the Penan people set up human blockades to try to stop logging on their lands. In Papua New Guinea, many ranchers now earn a living by raising herds of butterflies, crocodiles and wallabies instead of cattle, which destroy the land.

Time will tell whether efforts like these succeed in saving the world's emerald forests. "I see it as a race against time," says Dr. Strahl. "We have the power to save or destroy the rain forests. The fate of millions of species is on our shoulders." ♦

PHOTO © NOEL D. VIE/ARTIST



▲ In Papua New Guinea, crocodile "ranches" help protect the crocs as well as the rain forest.



PHOTO © SAI MO RAGI/PHOTOAT SOURCE/AMAU

▲ The last U.S. tropical rain forest is located in Hawaii. Demonstrators protest plans to build a power plant there.

Keep It Green

- Ask before you buy tropical plants like orchids or tropical animals like parrots or macaws. Make sure the plants and animals come from countries with programs that carefully control the number of jungle species sold.
- Be an energy saver. Turn off lights and shut off running water faucets. Recycle garbage. Everybody needs to change to protect Earth's natural resources.
- Stay informed. Support and write to conservation groups that work to save tropical forests. For more information about the rain forest, write to:

Wildlife Conservation International
c/o New York Zoological Society
Bronx, NY 10460

World Wildlife Fund/Conservation Foundation
1250 24th Street, NW
Washington, DC 20006

Rainforest Alliance
295 Madison Avenue, Suite 1804
New York, NY 10017

WAY TO GROW!

HOW TO MAKE A TERRARIUM

How can you make a rain forest grow in your own bedroom? Create a terrarium!

What You Need:

- large glass jar and lid
- small plants
- gravel or tiny pebbles
- soil
- small shovel
- paper cups
- water

What You Do

1. Look for plants in open fields, woods and backyards. (Make sure it's okay to dig them up!) When you dig up the plants, be sure to get as much of the root as possible. Bring the plants home in paper cups, and keep the roots wet. If you can't dig up plants, buy a few small ones. Wintergreen, boxwood, ferns, peperomia, philodendron, spider plants and mosses grow well in terrariums.

2. Wash and dry the glass container.

3. Put gravel or pebbles at the bottom.

4. Add soil deep enough to cover plant roots.

5. Carefully water the terrarium. The soil should be damp, but not soggy.

6. Cover the jar with the lid so that no air leaks.

7. Put your terrarium in a place with lots of light, but not direct sun. You won't have to water your rain forest often—it has its own “sprinkler system!”



Why It Works

Plants won't suffocate in the closed jar because the same air is used again and again. In daylight, plants “breathe” in carbon dioxide and give off oxygen. At night they turn the oxygen back into carbon dioxide. Water is also recycled in a terrarium. Plants take water from the soil, then release it through their leaves as water vapor. In a closed bottle, this vapor turns into water droplets.

The water then trickles back into the soil to be used all over again.



HEAVY METAL

by Michael Rozek



ROBOTS OF THE FUTURE MAY BE MORE LIKE PEOPLE

When most people think of robots, they think of old-fashioned, clanking metal machines that look like the Tin Man from *The Wizard of Oz*—or maybe R2D2, the little character from *Star Wars*. But before very long, says at least one scientist, robots are going to look and act a lot more like human beings!

"Ten years from now, we are going to have robots that will look like personal computers—except they'll be as big as humans, with humanlike legs

and hands, and will move on wheels," says Dr. Hans Moravec. He is the director of the world-famous Mobile Robot Laboratory at Carnegie-Mellon University in Pittsburgh, PA. "They'll be made out of special fibers—materials that are very light but strong. And they will be able to 'think' enough to do things like clean, cook and work in factories.

"And 20 years from now, we'll have robots who will be able to learn tasks. For example, if they're chopping food with their right hand, they'll be able

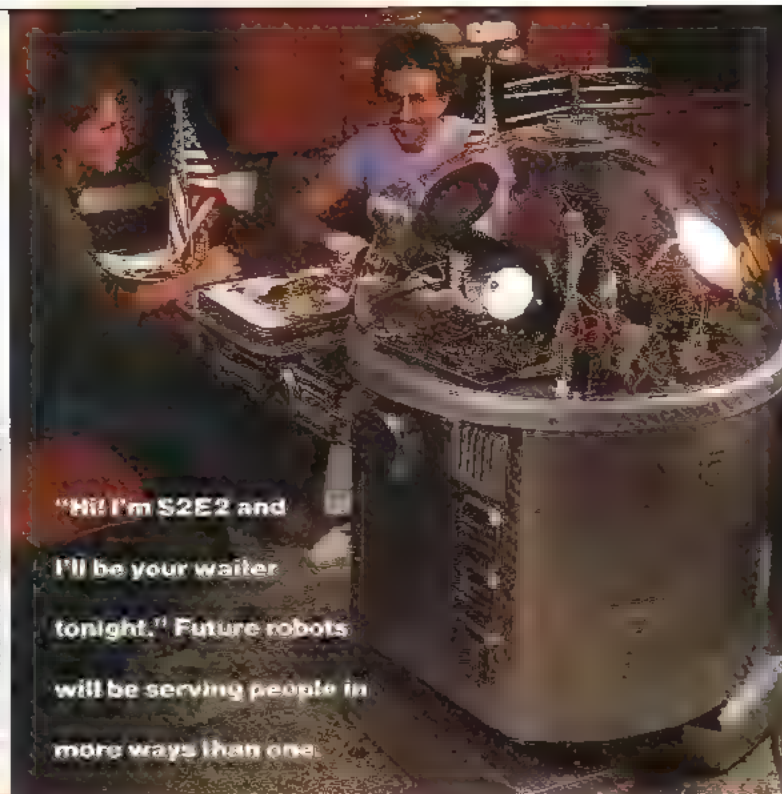
to switch to their left hand when they have to do something else with their right—automatically, without any help.”



Anything Humans Can Do...


And what about 30 years from now? Moravec says that by then, the making of robots will be the biggest industry on Earth—bigger than the auto or steel industries now. And the robots that will be made will be amazing: “They’ll be able to walk into a room, look around and know what objects the room has in it. Then the robots will use those objects, just like we do. For example, when robots

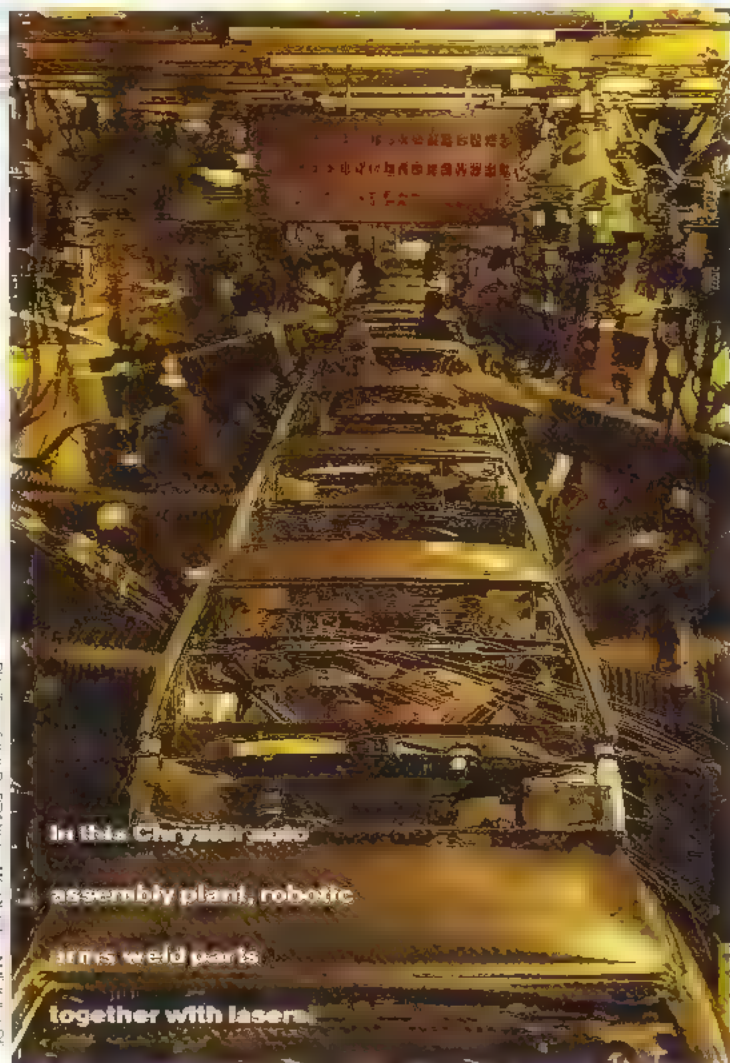
PHOTO © JAMES WILSON/WOODFIN CAMP & ASSOC.



go into the kitchen, they’ll automatically know there’s silverware in the knife drawer, and where the cups and glasses are, and where the food is. Then, they’ll be able to put all their knowledge to use, and make a meal!”

But if you really want a shock, consider what Moravec figures robots will be like in 40 years: “They’ll be able to do everything humans can do, and mostly, do them better.” Robots, says Moravec, will not only run assembly lines in factories, but manage companies, too. “In 50 years,” he sums up, “robots should be equal to humans, and they’ll come in as many shapes and sizes as animals.”

It may sound incredible that robots will be able to perform tasks as well as humans. Even though they have only been around since the mid-1960’s, robots are already a lot more sophisticated than many people realize. Right now, a robot designed by students at a university in Tokyo, Japan, can play classical music at a piano keyboard almost as well as a top pianist can. Another Japanese-designed model can tie knots with its mechanical hands. And researchers at the Massachusetts Institute of Technology and the University of Utah have designed a robot that can pick up an egg, break it, separate the yoke and the white, then use its index finger to beat the egg into a froth! 



In this Chrysler auto assembly plant, robotic arms weld parts together with lasers.

PHOTO © JAMES WILSON/WOODFIN CAMP & ASSOC.

PHOTO © JAMES WILSON/WOODFIN CAMP & ASSOC.

Scientists at MIT have built another robot that can hop around like a pogo stick. And two robots at Carnegie-Mellon University are capable of beating grand masters in a game of chess.



Brainy Robots

According to Moravec, technology that will make even better robots possible is here or is about to be developed. For example, lasers could serve as "eyes" for robots and help them perform complicated tasks—just like lasers now aid doctors in surgery. Robots could also be cheaply powered by the principle of superconductivity. (That's a way of sending great amounts of electricity through special, very cold wires.) And most important of all,

they could be given super "brains."

"For a robot brain to do what a human brain can do," explains Dr. Moravec, "it would need a computer that could complete 10 trillion operations per second. That's 10,000 times as many as any supercomputer can do today, and a million times as many as a personal computer can do. We don't have computers like that yet, so we don't have intelligent robots yet. But computers are becoming smarter and smarter more rapidly, so it's just a matter of time."

Other scientists agree with Moravec's predictions—even if they don't think robots will become so advanced quite so soon. "Technology moves slowly," says Dr. Jean-Claude Letombe. He is the director of robotics at Stanford University. "Robots are going to depend on motors and computers and new materials to make them. And all these things need to become more sophisticated. Also, not many companies are investing money in developing robots right now. But we can expect a lot from robots. What people have to remember is that once upon a time, people didn't believe computers would advance very far, either"

When it comes to robots, Moravec is a believer. One day, he thinks, they will become so advanced

Dr. Hans Moravec

expects robots to give humans a helping—mechanical—hand.



▲ **Hot dog! The robot arm moves along with the human arm. Disabled people will one day be aided by devices like this.**

▶ **More and more, robots are performing tasks dangerous to humans—like getting rid of bombs.**

they will be able to repair, build and even improve themselves—which will make them develop even faster. “Robots are limited now because human beings are working on them,” he says. “When they can use their intelligence to speed their own growth, they could surpass us.”

Yet, that doesn’t scare Moravec. “When I consider how a robot brain with a trillion chips of memory could outthink you or me, I get excited,” he says. “Robots could help us solve our pollution, disease and hunger problems. They could be an important key to real progress.”

Again, not everyone thinks like Moravec—especially when he starts talking about how robots might catch up to humans. But there’s no doubt that as a scientist, he’s basing his theories on existing facts. Stay tuned! ♦

Tomorrow’s robots

probably won’t look

like this clunky model

from the old TV show

Lost in Space.



PHOTO BY ANTONIO

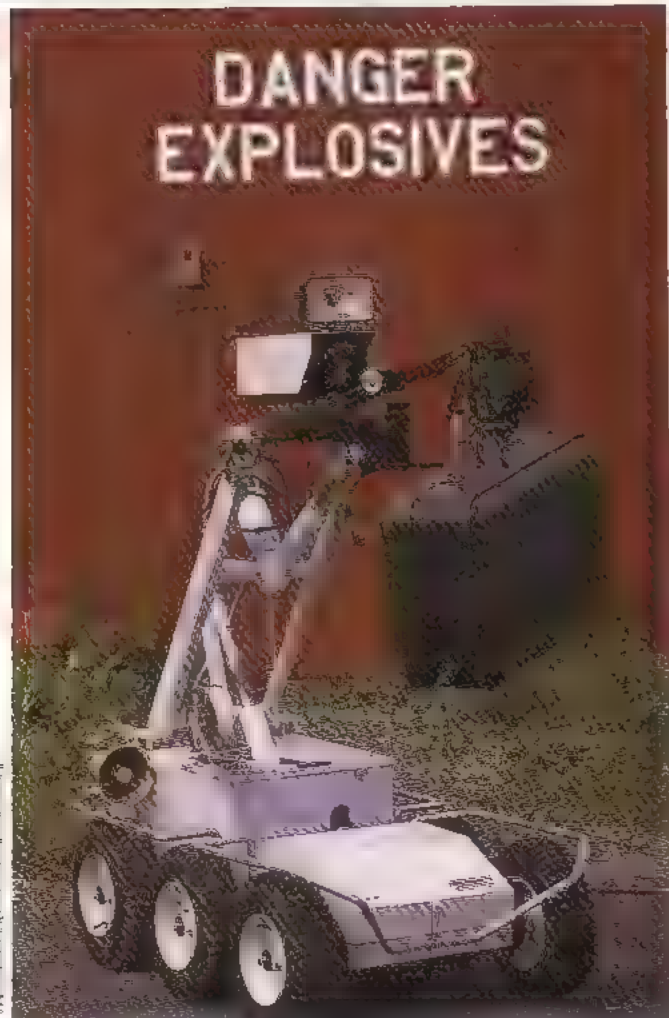


PHOTO BY ANTONIO



INK

POT-BELLIED PIGS AS PETS? YOU BET!

Mrs. Sissy Millerstrom of Berkeley, California, loves to watch her guests' faces, the first time they meet Adrian.

Adrian is a chunky, bristly, black-haired animal. He trots over to greet visitors, eagerly snorting and grunting. According to Sissy, alarmed guests say, "What's THAT?!"

The answer is simple. Adrian is a pig. Not the big pink kind you'd see on an American farm. He's a pot-bellied miniature Asian pig. And Adrian's visitors aren't the only ones who are in for a surprise.

That's because Adrian is part of a new pigs-as-pets craze. Today, the expensive animals—up to \$1,500 per pig—are living happily in several thousand U.S. homes!

Pot-bellied pigs have been common in countries such as

Vietnam, China, and Thailand for thousands of years. There the pigs are raised both for food and as pets. But until recently, these pigs had never been in North America.



How Did They Get Here?

They wouldn't have come if it wasn't for the efforts of a Canadian farmer, Keith Connell. For years Keith had tried to get permission from his government to buy some of these exotic animals.

Finally, in 1985, the Canadian government gave in. Eighteen pot-bellied Asian pigs were put on a jet and began their long trip.

The pigs arrived safe and

sound. They thrived on the Connell farm, and news of their arrival spread quickly. Soon the pigs were appearing on TV talk shows such as *Good Morning, America*. (The pigs' owners did the talking!) The pigs had litters of babies, which Keith sold to zoos and other pig breeders. People all over the U.S. began buying friendly Asian pigs as pets.



Small Is Beautiful

In the past, most people have kept only *baby* pigs as house pets in the U.S. That's because American pigs quickly grow too big to stay indoors. A full-grown pink farm pig can weigh over 1,000 pounds! They can also grow up to be very unfriendly.

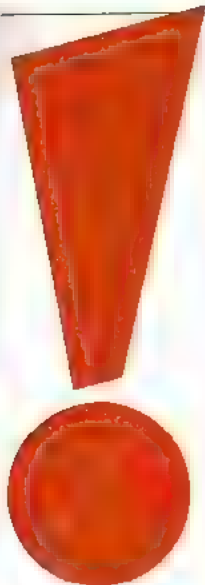


PHOTO © KASH

PHOTO © KASH



Kiyoko Hancock takes McDuffy, one of her pet pigs, to visit senior citizens. Humans get a kick out of McDuffy.

McDuffy spends a lot of time sniffing the grass. He is about 17 inches tall and weighs about 90 pounds.

The average adult Asian pig, on the other hand, rarely weighs over 90 pounds. The pigs grow to be about 17 inches high, at the most, and remain good-natured throughout their life (about 15 to 20 years).

The Millerstrom's Adrian appears to crave affection. "If you scratch Adrian's belly, he

just falls right down on the floor with his feet in the air," says Nikolett, 17.

Nikolett's sister, Jessica, 13, says that at first her friends all said, "You've got a pig living in your house? Gross!"

That's because most people think of pigs as messy, dirty and smelly. In fact, pigs like to keep

Kiyoko Hancock

gives her pet pig

Sidney a snack.

Kiyoko holds on to

Marissa, a piglet.

clean, don't smell and are easier to housebreak than dogs. Keith Connell's daughter Karen told CONTACT: "In just a few days, these pigs will learn to oink when they want to be let outside."

Like all pigs, the pot-bellies wallow in mud. That's because pigs don't have many sweat glands. They have to dunk themselves now and then to stay cool. But mud isn't the pig's first choice. They much prefer clean water.

Pigs are smart, the smartest of all farm animals. They can learn the same tricks as dogs, and they can learn them faster. Pigs can be taught to heel, tumble, fetch, obey the command "No!," pull a cart and stand on their hind legs.

Adrian seems to enjoy the family telephone. Whenever he gets the chance, he knocks the receiver off the hook and presses the touch tone buttons with his sensitive nose. Then he stands very still—with just his ears moving—as he listens to the voices that come over the wire.

"Pigs have the IQ of a human five-year-old," claims Kiyoko Hancock. She breeds pot-bellied pigs in Pescadero, California. They're curious about the world around them, and they can solve problems to get what they want.

Of course, when a pet pig

solves a problem, it may be *making* a problem for its owner. For instance, Kiyoko's pig Arnold figured out how to open all the sliding doors in her house. "And he never bothered to shut the door behind him!"

Then there was the time a pig owner called Kiyoko and asked if it was alright to give Louis, her

pig, juice bars from the fridge.

"I said sure," recalls Kiyoko, "but don't let him see where they come from."

Her advice was ignored. "The next day they came home and found the refrigerator door open. Louis was inside. They had to pull him out by his hind legs. He had eaten *everything*. His stom-



PHOTO © ROBERT J. MCGINN

ach was so swollen his feet didn't touch the ground!

"After that, they tried taping the fridge shut but Louis just peeled the tape off," says Kiyoko, laughing. "I told them to put a latch on the fridge way up high. Otherwise Louis would probably push a chair over to the fridge, stand on it, and open the latch with his snout."



Looking Out for the Pig

A former horse-trainer, Kiyoko now raises pigs full-time. She has become one of the pot-bellied pig's biggest American fans. She publishes a bi-monthly pig newsletter (*The Pig Tale Times*) and runs a pig-owners' hotline. She's also worked hard to protect the pigs' well-being

"When there's a pet craze, people start breeding the ani-

mals like crazy and use incorrect breeding practices," says Kiyoko. "That's what happened with the German Shepherd. They were bred at these doggy mills. Now it's hard to find a German Shepherd in this country who doesn't suffer from hip disease."

So Kiyoko started a pig registry—to keep track of each pig's family tree. "Scientists have found that it's bad to breed brothers and sisters," explains Kiyoko. By registering each of the Asian pigs and keeping track of who its parents are, she hopes that American breeders can avoid this problem.



Old Friends

Kiyoko herself always has five or six baby pigs living with her in her house. (They have their

own room, and each pig has its own pig sized bed and blanket.) While she's looking for a permanent home for the pigs, Kiyoko likes to take her young pets on lots of trips to old age homes and hospitals.

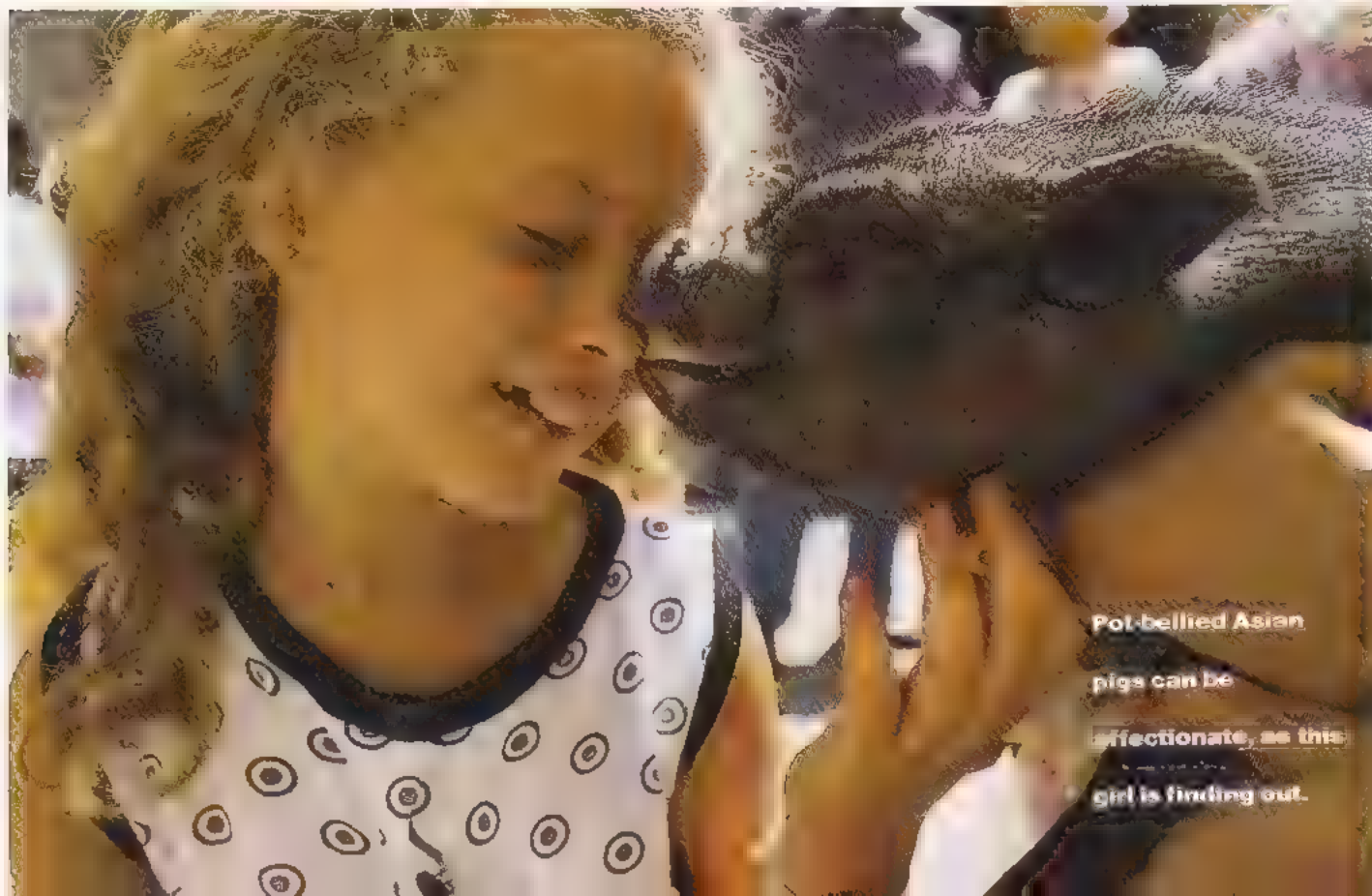
"I call them my little mental health workers," says Kiyoko. She's found that a baby pig trotting down a hospital corridor can cheer up a lot of patients very quickly.

Kiyoko's pigs were especially popular at the Kimochi Home, a nursing home for aged Asian-Americans in San Francisco, California.

"There were people there who hadn't seen pigs like these since they were kids," says Kiyoko. "Their faces just lit up. One woman started singing the pigs a lullaby in Japanese."

Thousands of miles from home, the baby pigs had found some old friends. On the other hand, for these pigs, making new friends is never a problem. ♦

PHOTO © KASH

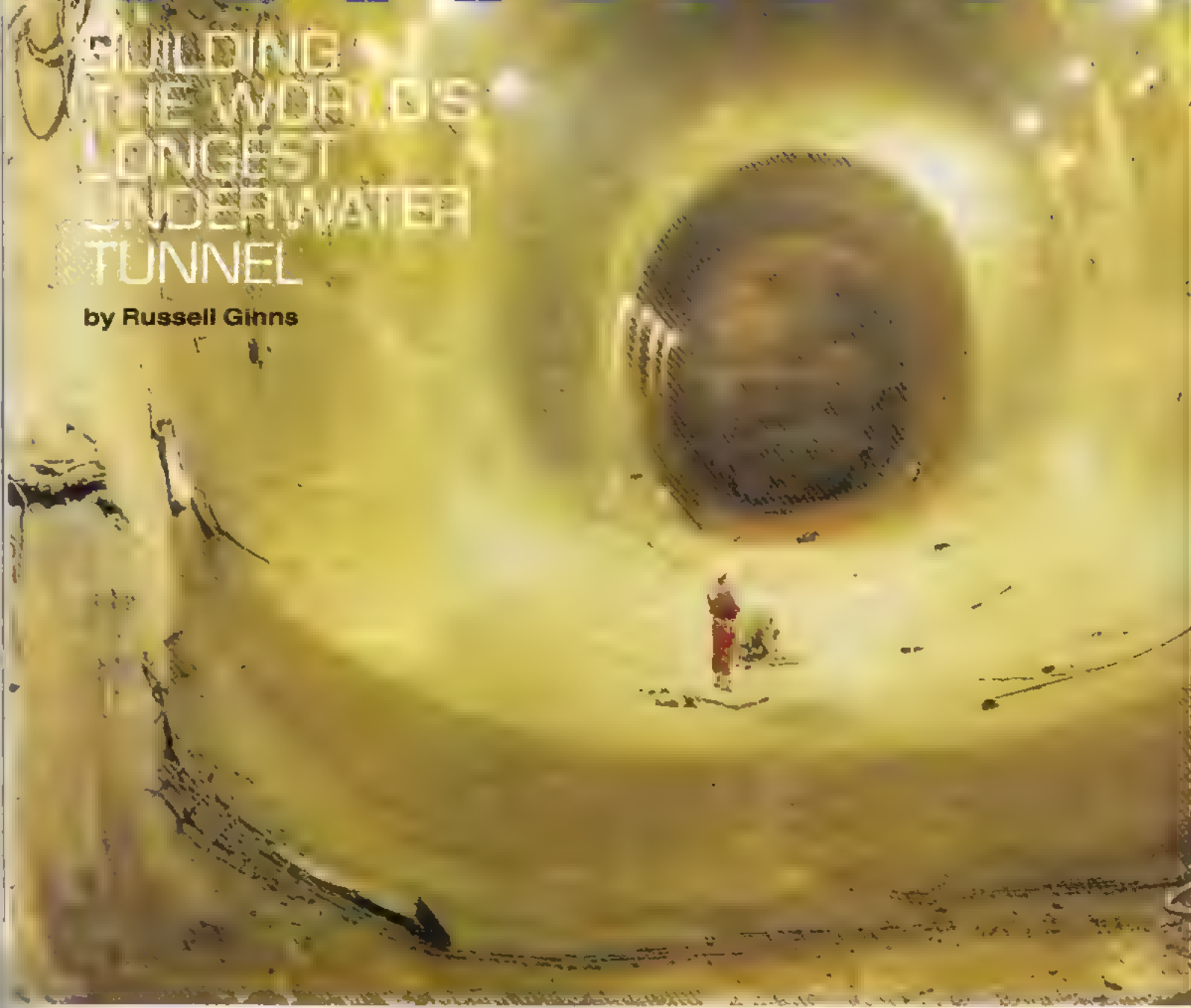


Pot-bellied Asian pigs can be affectionate, as this girl is finding out.

CHUNNEL VIS

BUILDING THE WORLD'S LONGEST UNDERWATER TUNNEL

by Russell Gihns



It's hot. It's dusty. Bulldozers rumble past in every direction. Up ahead, explosions mix with the rattling of jackhammers and shovels. And a few hundred yards away, machines bigger than the biggest dinosaurs are grinding their way from England to France.

This is what it's like to work

on the Channel Tunnel, known as the Chunnel. It's located 100 feet below the floor of the English Channel—the body of water that separates the two countries. The Chunnel is the world's longest underwater tunnel. Costing more than 13 billion dollars, it's one of the biggest construction projects in history.



Under the Weather

Most people travel between France and England by ferry boat. The trip takes about three hours—if the weather is good. Storms sometimes make the trip

ION

much longer. And, over the years, these storms have sent several ships to the bottom. That's why people have always dreamed of building a roadway beneath the Channel.

Architects and scientists have tried to find ways to build such a tunnel for centuries. But, until recently, they just didn't have the skills to do it. In 1882 a group of engineers actually began digging on the English side of the Channel. They drilled about two miles before their machinery got stuck in clay. Then, they ran out of money and had to give up. In fact, there have been 27 attempts to build a Chunnel in the past 200 years.

Now, two companies, Eurotunnel and TML, are doing the impossible. Digging from both sides of the Channel, they have already drilled under more than 15 miles of the 24-mile-wide body of water. Sometime this winter, two teams will meet at "Point M"—the spot where they will break through and shake hands.

"It will be a moment in history," says Eurotunnel Chair-

man André Bénard. "England and France will be joined forever under the sea."



Down and Dirty

While people above the ground are preparing to celebrate the underwater link between the two nations, people below are hard at work. And for the 2,000 workers who drill in the tunnel, it's a dirty, dangerous job.

"All construction work is dangerous," TML spokesperson John Hamlin told CONTACT. "Tunneling is probably the most dangerous of all."

Everyone who works in the Chunnel must wear bright orange jackets at all times so they can be seen through clouds of dust and smoke. In case there's a fire, each person also carries his or her own emergency breathing cannister. It's a device that changes carbon monoxide into carbon dioxide. This would allow a person to keep breathing long enough to escape. Before workers can climb onto the elevator that will take them to the tunnel entrance, they must hang their nametags on a pegboard. That's to make sure that the same number of people who go in come back out.

"But when you see the work we've done, it's worth all the trouble," says Hamlin. "The size of the project is mind-boggling."



Monster Moles

The workers use shovels, jackhammers, bulldozers and cranes to dig through the clay and chalk beneath the sea floor. But the most incredible work is being done by giant mechanical

PHOTOS COURTESY OF PHOTOS



"moles" called TBM's (tunnel boring machines). Each one is more than 650 feet long—bigger than two football fields—and each machine weighs about three million pounds. TBM's are crawling, drilling factories that can chew through rock and build tunnel walls at the same time.

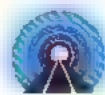
Because the machines are so huge, "We had to bring them down in little pieces and then put them together," John Hamlin told CONTACT.

It takes 20 people to operate a TBM as it slowly cuts through the Earth at a speed of 30 feet per hour. Conveyor belts inside the TBM carry away the ground-

up chunks of earth and dump it into wagons in the rear. Then, levers automatically press curved wall sections into place. As the TBM moves on, teams of workers follow with fire hoses that spray cement. They fill in the gaps between the wall sections, making it solid and watertight. "The guys who do that have it pretty rough," says Hamlin. "It's a messy job."

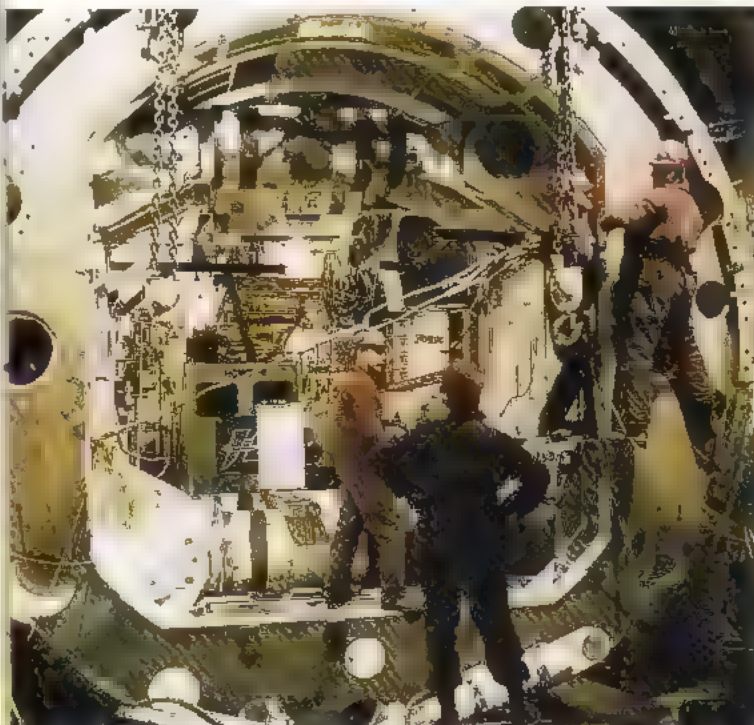
The first tunnel will be completed soon. It's only the smallest of three that will cross the Channel. It will be used as a service way for repairs and an emergency exit. Two larger tunnels will be for people to use.

They should be finished sometime next year. When that happens, the TBM's will be pushed to the side and buried under the Channel forever.

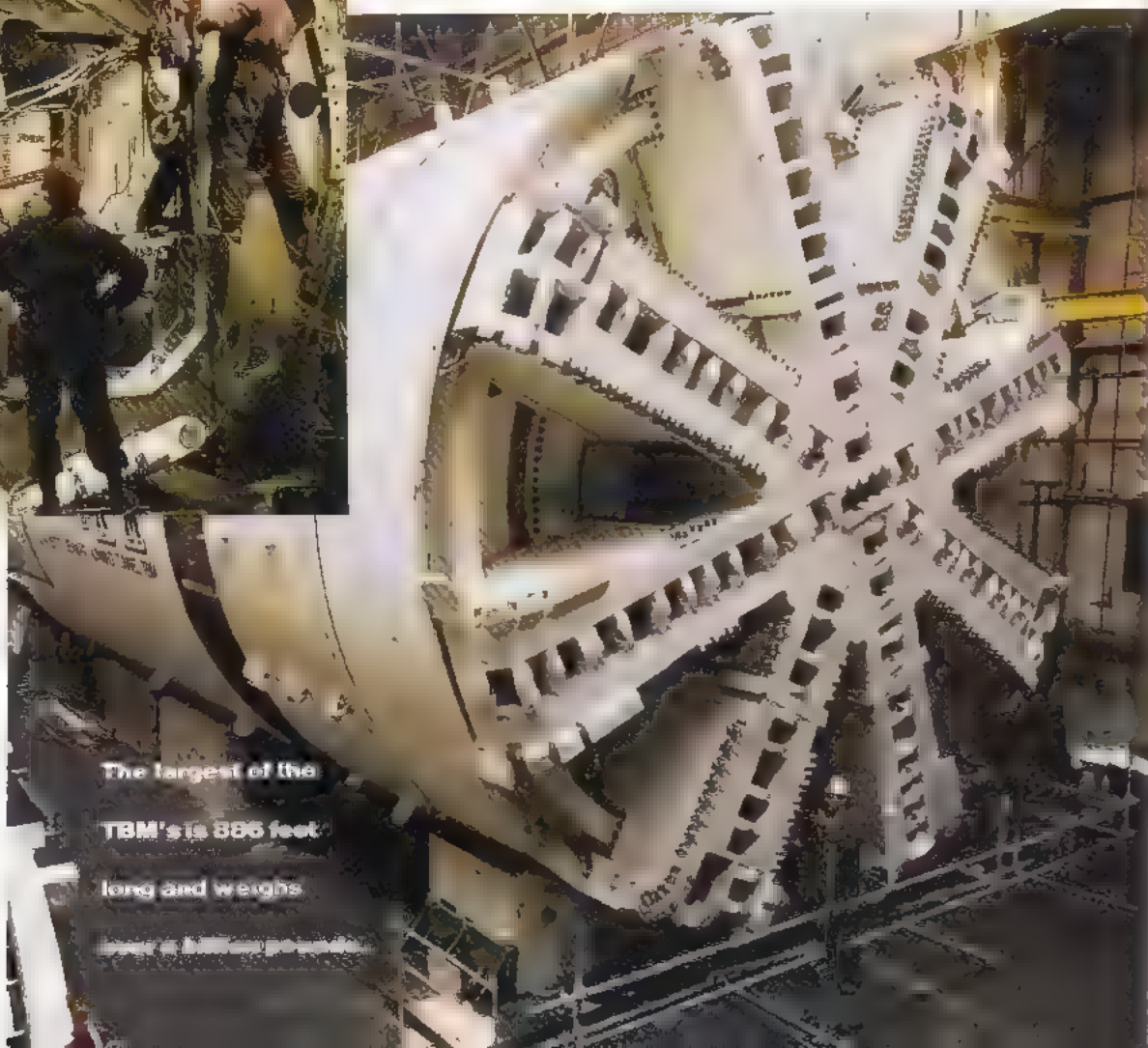


No Land Is an Island

When the Chunnel officially opens in 1993, people will be able to drive their cars onto a high-speed train that will rocket them through the Chunnel. The entire trip from Folkestone, England to Calais, France (a distance of nearly 32 miles) will



Twenty or more people work inside each TBM.



The largest of the TBM's is 886 feet long and weighs

over a million pounds.



take about 35 minutes.

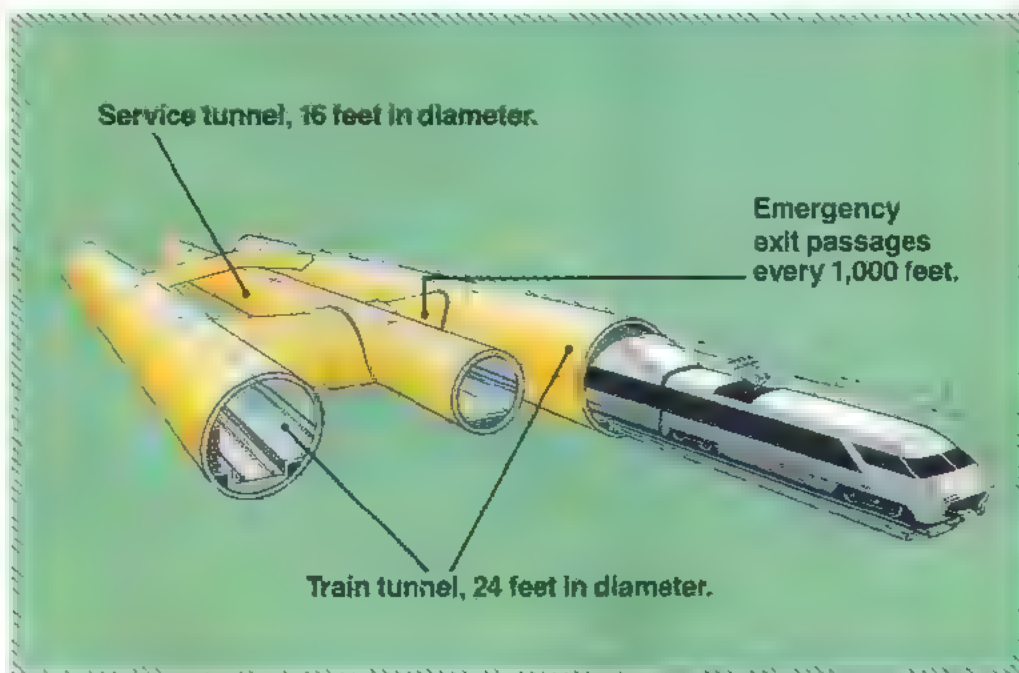
This doesn't make everyone happy. The people who live in Folkestone and Calais are watching their small towns quickly change into bustling, noisy cities. People who work on the ferries worry about losing their jobs. And some people simply don't like the idea of England not being an island anymore—the Chunnel will connect it with Europe permanently.

But the people building the Chunnel think that it will be good for businesses and jobs all over Europe. "It will be the safest and easiest way to travel," says John Hamlin. "You'll probably see a lot more tunnels like this in the years to come."

Besides, according to Joe Stacey, the Chunnel's construction manager, "England stopped being an island when the airplane was invented." ♦

**A team of workers celebrates
a breakthrough near the entrance
to the Chunnel in France.**

**When the Chunnel is completed,
high-speed trains will race
through it at over 150 mph.**



▼
Water flows over Niagara Falls at a rate of 1½ million gallons per second.

FACT



▼
Twenty-nine percent of the U.S. is forest land.



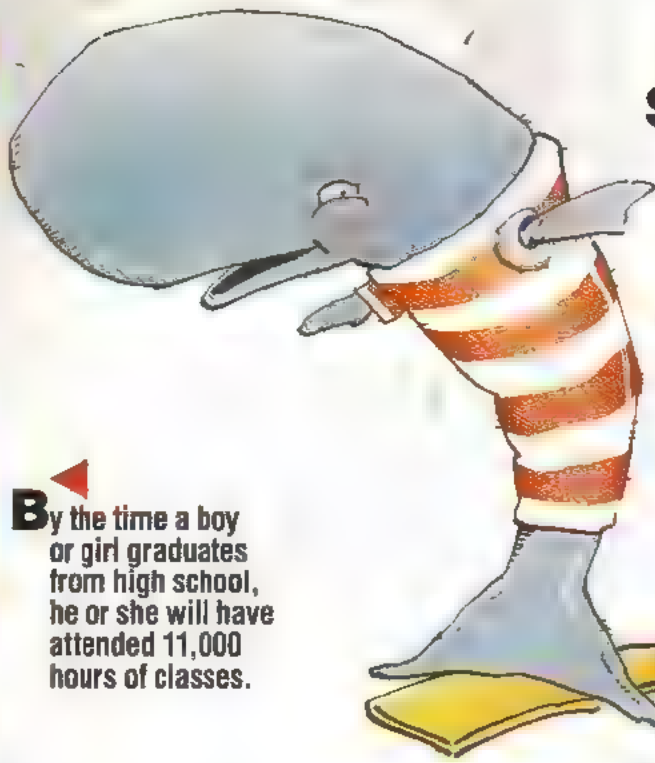
▼
The first wristwatch was made in 1790 in Switzerland.



OLDS



By the time a boy or girl graduates from high school, he or she will have attended 11,000 hours of classes.



Sperm whales can dive more than 9,000 feet under water.

Each July, Americans eat more than 1.5 billion hot dogs. That's more than in any other month.



THE TIME TEAM

FUTURE SHOCK

PART TWO

By Curtis Slepian

"Run, Jenny!"

Sean and Jenny rushed through the door. Racing down the corridor behind them were three armed men. In front of them was Slimeworld. The two teens sprinted into a yellow haze and hid behind a boulder. Panting, they looked back and saw the door, set in a heavy steel and concrete frame, slowly shut. Security agent Chicago Illinois and his men weren't going to follow them!

As far as they knew, Sean and Jenny were the only humans on the surface of the Earth. Jenny's time machine had taken them to the year 2098, a time when humankind lived in underground cities. The kids learned that the Earth's surface, called Slimeworld, had become too polluted for anything to live. When officials in the underground world tried to hold them prisoner, the teens escaped to Slimeworld.

Jenny and Sean tried the door. It was locked.

"Well," said Sean, "there's no returning. We might as well see what's going on."

Jenny gazed at the brown, dead landscape. Nothing moved. Nothing was green. "I don't think a whole lot is going on."

Sean took a deep breath and coughed: "The air quality here is the pits."

"These hills in the distance have no trees on them and —"

Jenny stopped because she had the feeling she was being watched. She turned around: a squirrel was looking at her.

"It's so cute," cried Jenny.

Then both kids stared at each other.

"A squirrel!" shouted Sean. "There's life! They

said nothing could live up here. The TV pictures on Level 46 made you think that you'd die as soon as you got above ground. But we're not dead!"

"No kidding, Sherlock."

The Dead Zone?

The kids started walking down a nearby road. All around them, nature seemed silent and dead. A few hours later, they entered a large town. A few houses had crumbled, but some were standing and in good shape. Jenny walked onto the front yard of one house and knelt down: "Look, Sean."

She had spotted a green stalk of grass rising out of the ground! That instant a loud grinding noise made the teens jump. Heading towards them was a robot! It was shaped like a man, but had no face. It started to talk: "Halt! You are in danger from ultra-levels of solar radiation and toxic waste inhalation. Come with me to a secure station for a med-check."

"It's Robocop!" screamed Sean. When the two kids started to back away from it, the robot's voice got angry: "You are in violation of Underground Penal Code 2456: Trespassing on Slimeworld."

Suddenly, the robot began to double over. Its sides opened, and wheels came out of its legs. It was transforming itself into a police wagon!

"Let's make like an egg and beat it," said Jenny.



"You should be arrested for making a joke that corny," gasped Sean as the two kids sprinted down the deserted street.

Though their lungs hurt, the teens outran the robot. With night beginning to fall, Sean and Jenny entered a deserted house. In the driveway was a car made of plastic. The empty house was filled with dust.

Just before the floor, Jenny said, "I keep thinking about that squirrel."

kids fell asleep on the floor, Jenny said, "I keep thinking about that squirrel."

"Yeah," said Sean, "and that stalk of grass."

The next morning the kids were starving. There was no food in the house, so they decided to hunt for something to eat.

As they left the house, Sean looked at the empty driveway and frowned: "Wasn't there a car parked here yesterday?"

"Obviously not."

They walked through the silent town, looking into homes for food. When they reached the main street, they discovered a supermarket.

Inside the store were shelves stocked with canned food. The teens didn't need an opener—they just pressed a bump on the side of the can and it opened automatically. Neat!

Both kids were polishing off canned spaghetti and meat balls when they heard a crash. "Do you think Robocop followed us here?" asked Jenny.

Worms and Wasters

Sean got up and tiptoed down an aisle displaying designer oxygen masks. Nothing. He turned down the next aisle, full of water purification devices. Empty. The next aisle sold home toxic waste detectors. As he turned into an aisle full of sun shields, a hand darted out and grabbed him.

"Hey, let go!" Sean yelled.

Jenny came running. They were both quickly surrounded by a group of ragged-looking people clothed in plastic garbage bags.

"You Worms?" asked one of the people.

"What are Worms?" replied Jenny.

"They're people who live below ground."

Sean said, "We just escaped from those guys. Who are you?"

"We're Wasters. We are the children of people who refused to go below in 2025. We drive from city to city, living off whatever things were left behind up here. The Worms and their robots try to force us underground. But we outsmart them."


"Isn't Slimeworld unhealthy?" asked Sean.

"Not as long as we keep out of the sun, drink only bottled water, don't eat anything that comes out of ground and don't breathe too deeply."

"Paradise," said Sean, rolling his eyes.

"We have a good time and don't care about tomorrow. You stay with us," said the leader, named Harold. "If they catch you, they bring you downstairs forever."

"We could use the time machine to get us out of here," whispered Sean.

Jenny shook her head: "I think we should find out why the Worms make Slimeworld out to be worse than it is." 



ILLUSTRATIONS BY BOB PERLIN

"I hate to admit it, but you're right," said Sean.

Harold took the kids on a drive. He raced through the streets, trying, he said, to use up as much gasoline as possible. Every once in a while, he tossed food cans out of the window and laughed.

They called themselves Wasters, Harold said, because they never recycled and were proud of it — it was their right to waste things. Sean and Jenny began to feel very uncomfortable.

"Maybe the library will tell us about life in the future," said Jenny.

Harold sneered, "We burned all the books and computer disks to roast some freeze-dried marshmallows. Boy, were they good."

That evening, Sean and Jenny took a walk. "I think we should tell everyone below that things aren't so bad up here," said Sean. "Maybe people would want to come to the surface to live."

"Halt!"

"Okay, okay, Jenny, I'll stop talking."

"That wasn't me!" said Jenny.

Before they knew it, the teens found themselves trapped in the robot/police wagon. It was dark and bumpy and noisy in there — sort of like being inside a food blender.

All of a sudden, the noise stopped. Then the back door opened, and metal springs pushed the kids out and into a steel room. The room was an elevator that descended for several minutes. When it came to a halt, the door hissed open. Standing before them was Chicago Illinois!

The Future Is Now

"Welcome back to Level 150," he said, turning to a man in a white coat. "Take these Wasters for a mind adjustment. Set it for partial memory loss."

"We're not Wasters," pleaded Sean.

The struggling teens were hooked up to a strange-looking machine, and electrodes were placed on their heads. The machine began to whine, and just as suddenly, it stopped. The man in white ran up to Chicago Illinois and said, "Look at the readings from the machine. These kids aren't lying. They're not Wasters."

In Illinois' office, the kids explained their tachyon machine. He said, "I'd like to use your machine, but it would cause dangerous paradoxes in time."

"We told you about us," said Jenny.

"Now give us the real deal about Slimeworld."

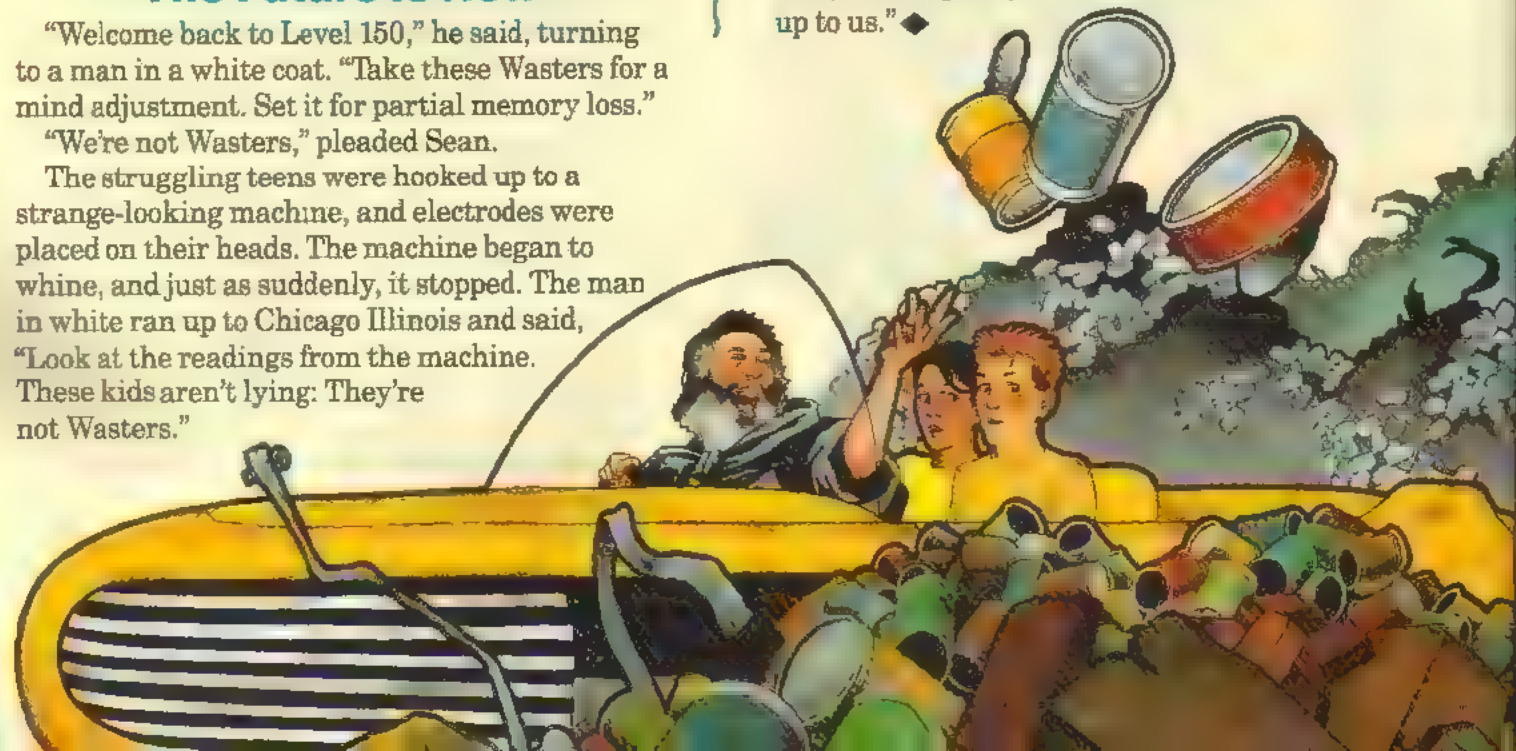
"The truth is complicated. By 2025, Earth was on its last legs because of pollution. The world governments decided secretly to make everyone live below. This has allowed the Earth to heal itself. Since then, with a bit of human and robot help, the effects of pollution have been greatly reduced — but living up there is still bad for your health. We predict that in another generation or so, we will be able to live on the surface. Until then, we can't permit anyone on Slimeworld. So we've had to scare people into believing that the Earth's surface is a very dangerous place.

"When you return to your time, nobody will believe what you say about the future. But you can work toward improving your present. Then, who knows? Maybe this future won't happen."

As a souvenir of 2098, Illinois gave each teen the year's hottest electronic gadget: a universal translator — a little device that let the wearer speak and understand any language.

With the mystery of the future cleared up, Sean and Jenny decided it was time to go home. On Level 0, Jenny pressed the button on her tachyon machine. Instantly, she and Sean were transported back to the corridor of their high school.

The next day in science class, Mr. Giddy asked the class about the future of the planet. To Mr. Giddy's surprise, Sean raised his hand and said, "That's pretty much up to us." ♦



BODY HEAT

Birds of a feather do stick together—especially on chilly mornings in this park in Botswana, a nation in Africa. Staying warm is a family affair for this group of swallow-tailed bee eaters. In fact, the 24 species of bee eaters are rarely alone—most hang out in pairs or in large families.

Bee eaters are professional exterminators. They specialize in killing and dining on bees and wasps. And they aren't bugged by those nasty stingers, either.

Once a bee eater snatches an insect from the air, it carries its dinner back to a perch. The bird pounds the insect's head and rubs the hard end until the poison is gone. Then, the bee eater gulps down dinner, stinger and all.



DO BRAIN TEASERS MAKE YOU SNARL? THEN TRY OUR...

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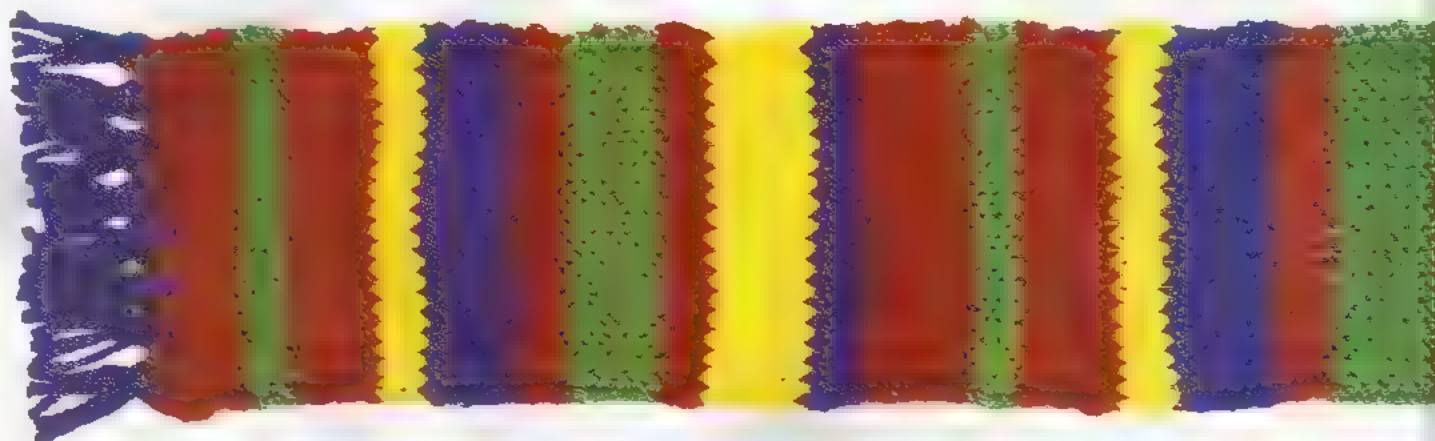


▼ **Twisted**

Can you find the one yarn that connects both needles?

Wrapper's Delight

Study the stripes on this scarf carefully. Can you figure out the pattern? ▼





PHOTOGRAPH BY STAN ELLEMAN

HANDMADE BY LISA J. GAINS

▲ Afghan with a Plan

There are eight different patterns hidden in this blanket. Can you identify the pattern for each column and row?

Answers on the Did It page



A SQUARE ONE PUZZLE

BIG DEAL KIDNAPPED BESS BLUEHART AND TOOK HER TO HIS SECRET HIDE-OUT. BUT HE LEFT A CLUE...

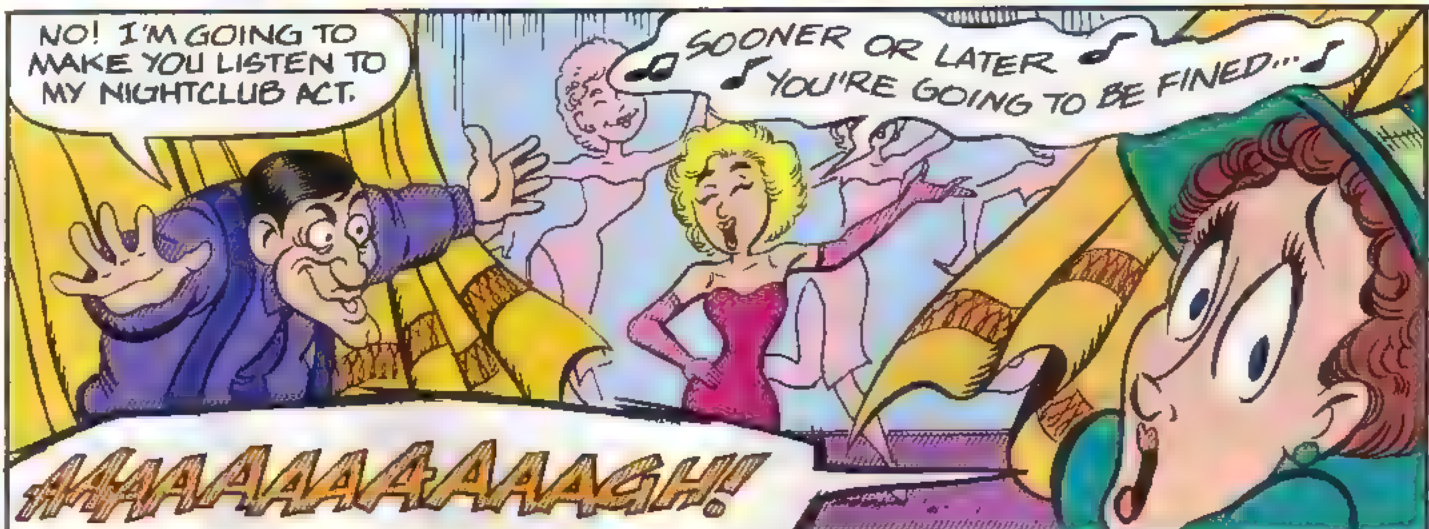
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5-5-3-5-1-6-N

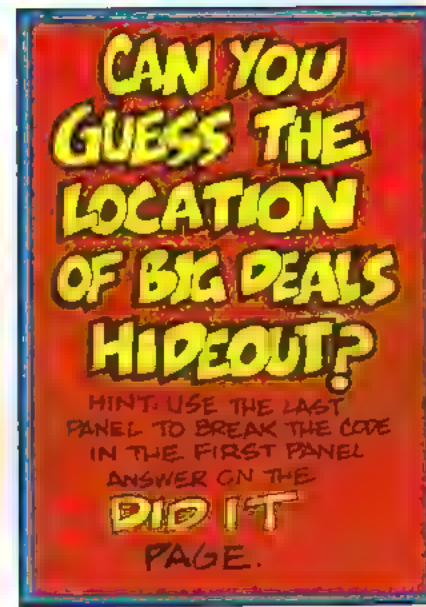
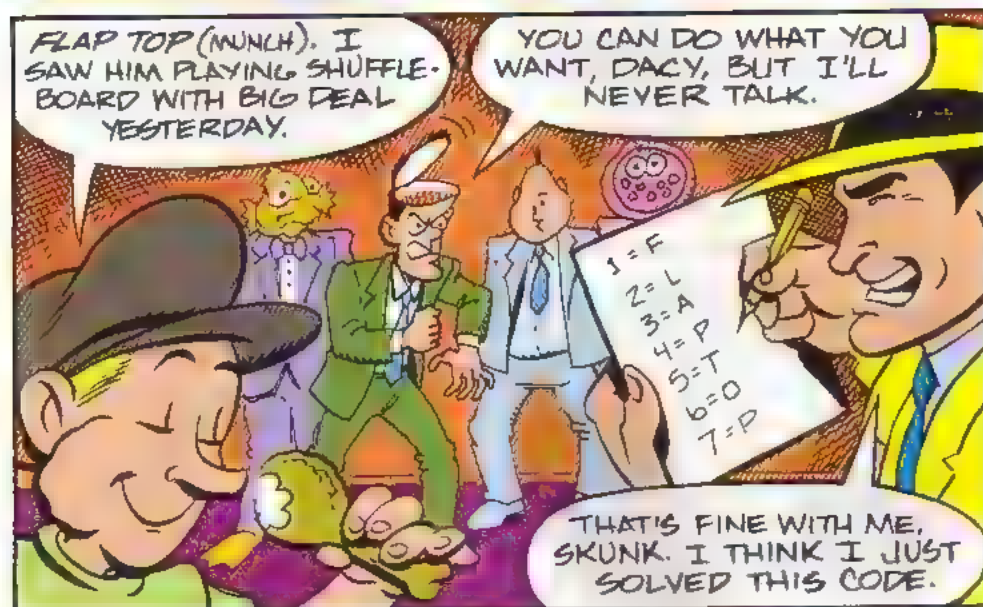
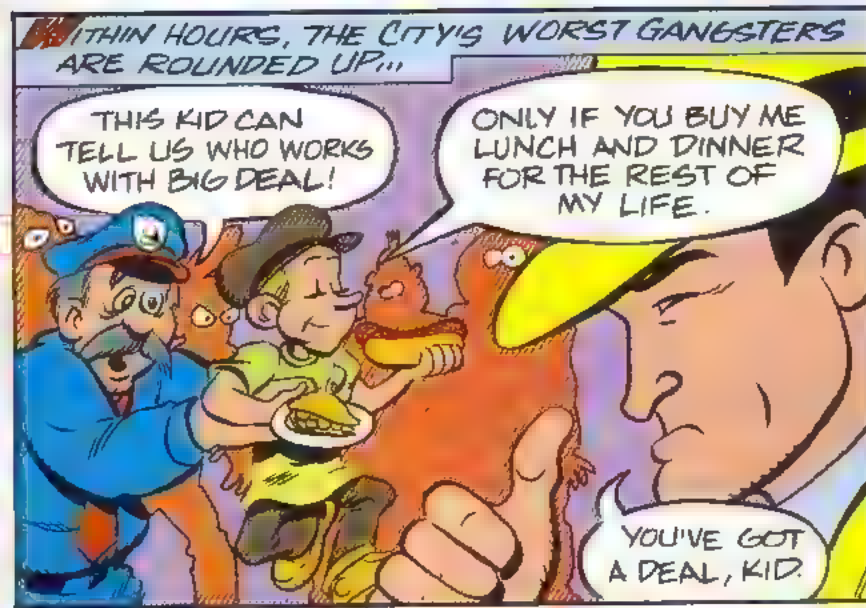
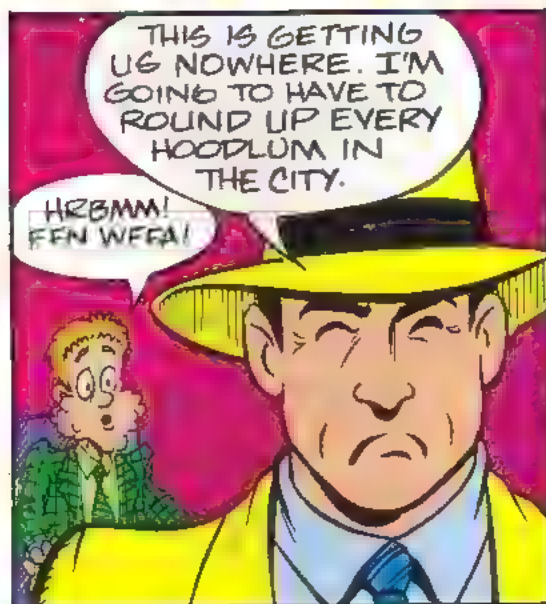


YOU'LL HAVE TO
FIND MY PARTNER
IF YOU WANT TO
BREAK THIS
CODE!

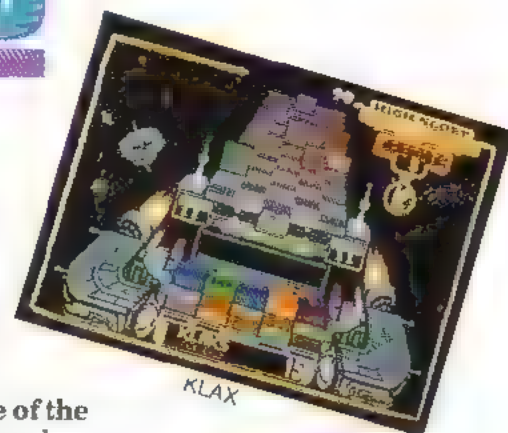
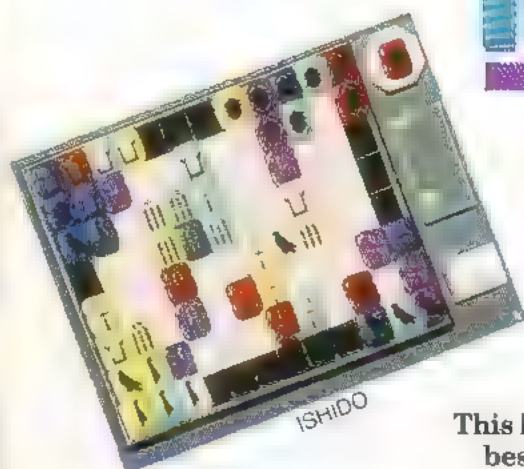
STORY:
RUSSELL GUNNS

ART
KE TH
WILSON





REVIEWS



This holiday Reviews section features some of the best new books and computer games around.

Compiled by Russell Ginns

COMPUTER SOFTWARE

Ishido

For IBM, Amiga and Macintosh
Accolade, \$54.95

This strategy game challenges you to place stones of different colors and shapes on a board of 96 squares. Of course, you can't just place them anywhere—matching the stones in the winning combinations is very difficult. It's easy to get started, but we think you'll want to play *Ishido* over and over again.

Where in Time Is Carmen Sandiego?

For IBM, Macintosh, C64,
Apple II and Amiga
Broderbund Software, \$44.95

Carmen Sandiego and her gang are messing up history! They're traveling through time, stealing famous paintings and inventions. You're a detective with a time machine and it's up to you to stop her.

There are more than 1,200 clues in this mystery adventure. And the program comes with a desk encyclopedia, which you'll need to track the tricksters.

Darwin's Dilemma

For Macintosh
Inline Design, \$34.95

This puzzle game is loosely based on the theory of evolution. For each level, you must combine groups of simple creatures, like worms, until they evolve into groups of more complex animals, like turtles. It's a tough brain teaser and a lot of fun.

Balance of the Planet

For IBM and Macintosh
Cris Crawford Games, \$49.95

In this simulation game, it's up to you to save the planet. You decide how much coal to burn and which pesticides you should use. At the same time, you've got to make sure that people have all the jobs, energy sources and food that they need. You'll probably find out it's not so easy to keep humans happy and the planet green.



GAME CARTRIDGES

Klax

For Nintendo, Genesis and
TurboGrafx-16
Tengen, \$39.95

Think fast! Colored tiles are flopping down a track and you've got to push them into groups. Sounds easy? It's not! *Klax* is the funniest shapes puzzle since *Tetris*. It's fast-paced, challenging, a little frustrating and a lot of fun!

Kwirk

For Nintendo Gameboy
Acclaim, \$29.95

This game is a series of maze-like puzzles to solve. You have to escape from each one to get to the next. It doesn't take long to figure out how to play, but the toughest *Kwirk* puzzles are almost impossible to solve!

RBI Baseball 2

For Nintendo, Genesis and
TurboGrafx-16
Tengen, \$44.95

We think this is one of the very best video baseball games available. It's not too complicated, so there's plenty of action, excitement—and errors! And best of all, *RBI 2* fields the real 1989 major league teams.

Phantasy Star II
For *Genesis*
Sega, \$44.95

If you're looking for an intense adventure game, look no further. *Phantasy Star II* has so many maps, mazes, clues and objects that you'll need to use the 115-page hint book to reach the end of this massive game. It's an exciting space adventure that will keep you playing for a long, long time.

Bonk's Adventure
For *Turbografx 16*
NEC, \$39.95

You're a tiny caveman in dangerous prehistoric times. Your only weapon—your head! As you struggle to save Princess Za, you'll have to bonk away hundreds of silly but ferocious creatures. *Bonk* is a funny action game with walking palm trees, flying boxing gloves and many surprises.

BOOKS

Small Worlds
by *Joseph W. Kelch*
Simon & Shuster, \$15.95

This book lets you explore the 60 moons of our solar system. From the fiery volcanoes of Io (near Jupiter) to the icy slopes of Triton (near Neptune), you'll learn about some of the most mysterious places ever discovered. Great photos and maps make this book a must for all space explorers.

The Stunt Kite Book
by *Alison Fujino* and
Benjamin Ruhe
Running Press, \$14.95

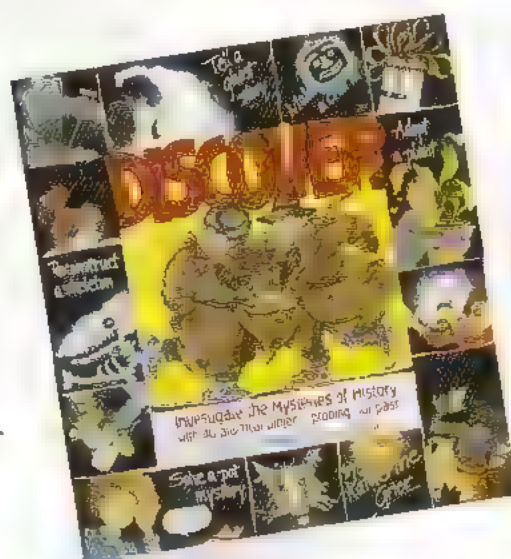
Take off! This book introduces you to the world of stunt kites. You'll learn the history of this hobby and some of the tricks of the trade. *The Stunt Kite Book* even comes with its own kite so you can start riding with the wind.

Scientific Eye
by *Adam Hart-Davis*
Sterling, \$7.95

What makes a kettle whistle? How does an airplane stay up? This book has the answers to those questions, and hundreds more. You'll learn about hiccups and sneezes and vacuum cleaners. Factoids, riddles and experiments fill every page. *Scientific Eye* will open your eyes to some scientific fun.

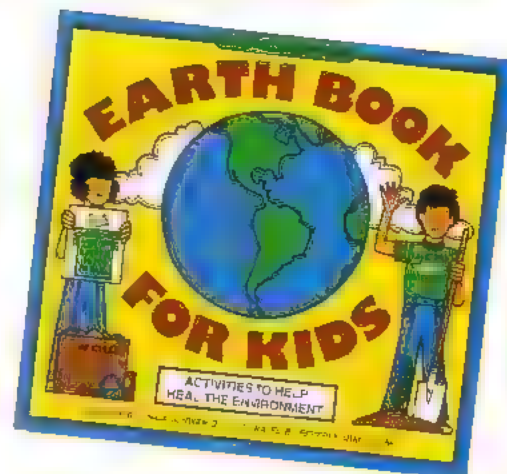
Start Exploring Oceans
by *Diane and James Tyler*
Running Press, \$7.95

This is actually a super-detailed coloring book. But while you're filling in the pictures (no easy task), you'll be learning amazing facts about ocean life. Barracudas, giant squids, whales and walruses will keep your fingers busy and your eyes surprised.



Discover
by *Katherine Grier*
Addison-Wesley, \$8.95

Hunt for fossils! Have a prehistoric dinner! This book is full of activities that will help you learn about the mysteries of history. From the age of the dinosaurs to the Middle Ages, you'll learn about plants, people, places and events that made us the way we are today.



Earth Book for Kids
by *Linda Schwartz*
The Learning Works, \$9.95

Every day we hear about the environment and pollution. But what can we do about it? Plenty! Here's a book full of things that you can do to save the planet. Help save water in your home. Rescue wildlife in your own neighborhood. *Earth Book* has more than 100 things that you can do—and should do—right away!

UFO's—The Fact or Fiction Files
by *Anne Canadeo*
Walker & Co., \$14.95

Flying saucers don't really exist—or do they? This book lets you form your own opinion. One half of this book has stories and evidence that could make you believe in UFO's. The second half of the book tries to prove that UFO's aren't real. Read both halves and decide for yourself!

Animal Olympians
by *David Taylor*
Lerner, \$12.95

Cheetahs run the fastest. Elephants can lift the most weight. But which animal would make the best all-around athlete? Here's a book that tries to answer that question and hundreds more about the champs of the animal kingdom. You'll learn about cheetahs, chimps, frogs and fleas. And you'll never guess who the writers think is the greatest athlete of them all. (Hint: *Grrrrrrr!*)



Welcome, whiz kids! It's time for another Slipped Disk Show, and you're in luck, because I happen to be the one-and-only Slipped Disk, world-famous computer expert.

And speaking of computers, my dog, Floppy, is using a computer to cook a holiday dinner this year. He put all of our recipes on a disk. The only problem is I used the same disk for a computer game called "The Slimy Trolls From Someplace Else." I just hope he doesn't get them mixed up or we'll be eating roast dragon with ogre stuffing.



And speaking of stuffing, my mailbox is really stuffed, so I better answer some letters. Here's one from Jessica Cirkus, age 10, of Wayne, New Jersey. Jessica asks:

"What does the command 'Randomize Timer' do?"

Jessica, random numbers are used in computer programs when-

ever the programmer wants to pick a number by chance. (It's kind of like rolling a pair of dice or flipping a coin.)

But how does a computer pick a number by chance? Randomize Timer is one way of doing it. When the computer sees this command, it reads the time on its clock. Then it uses that number to create a long list of "random" numbers. Since the clock is always changing, chances are very good that



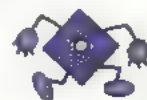
the computer will create a different list of numbers every time you run this command.

And speaking of time, it's time to answer another question. This one is from Brandon Potter of Kalamazoo, Michigan. Brandon asks:

"I've heard that computers are getting smaller and smaller. How small are they?"

Brandon, computers

are getting smaller. The first computers, 50 years ago, filled whole rooms. Now there are hand-held computers about as big as paperback books.



Computers are getting smaller mainly because scientists have figured out ways to get more onto computer chips. The computer chip, which is only about the size of your fingernail, is the brain of the computer. The circuits or "wiring" on the chip are smaller every year. In fact, tucked into the corner of new chips you'll often find all of the circuits of the old chip they are replacing.



And speaking of replacing...next month I'll be replacing these old letters with new ones. I can't wait to hear from all you readers out there. So if you have any computer questions, send them to me at:

THE SLIPPED DISK SHOW
3-2-1 CONTACT
1 LINCOLN PLAZA
NEW YORK, N.Y. 10023

BASIC TRAINING

Programs For Your Computer

LET IT SNOW!

For IBM Computers
with graphics card

They say that no two snowflakes are alike. Here is a program that might help prove it. There are fewer dots on your computer screen than molecules in a snowflake. But the dots can be arranged more than 36 *quadrillion* different ways! So we don't think you'll spot any two that are identical.

Every time you hit the space bar, a new snowflake will appear. When you want to quit, press Q.

```
10 DIM R1(55), SP(50): GOSUB 520
20 RANDOMIZE (VAL(LEFT$(
  (TIMES,2)))
30 SCREEN 1: CLS: KEY OFF
40 GOSUB 180
50 XS = 30: YS = 19
60 BASE = 0: B2 = 0: RANGE =
  19: CX = 0
70 GOSUB 310
80 BASE = 2: B2 = 19: RANGE =
  16: CX = 1
```

```
90 GOSUB 310
100 BASE = 6: B2 = 35: RANGE =
  10: CX = 2
110 GOSUB 310
120 BASE = 6: B2 = 45: RANGE =
  10: CX = 3
130 GOSUB 310
140 AS = INKEY$: IF AS = " " THEN
  140
150 IF AS < > "Q" AND AS < > "q"
  THEN 30
160 SCREEN 0: CLS
170 KEY ON: END
180 FOR X = 1 TO 19
190 Y = RND*100
200 R1(X) = 1: IF Y < 25 THEN
  R1(X) = 0
210 NEXT
220 FOR X = 1 TO 16
230 Y = RND*100
240 R1(19 + X) = 1: IF Y < 50 THEN
  R1(19 + X) = 0
250 NEXT
260 FOR X = 1 TO 20
270 Y = RND*100
280 R1(35 + X) = 1: IF Y < 75
  THEN R1(35 + X) = 0
290 NEXT
300 RETURN
310 FOR X = 1 TO RANGE
320 X1 = X + BASE
330 IF R1(B2 + X) = 0 THEN 470
340 REM draw points
350 PX = XS + CX: PY = YS + X1:
  GOSUB 500
360 PX = XS - CX: PY = YS - X1:
  GOSUB 500
370 PX = XS + CX: PY = YS + X1
  GOSUB 500
```

```
380 PX = XS - CX: PY = YS + X1:
  GOSUB 500
390 PX = XS - CX - X1: PY = YS
  + CX - X1: GOSUB 500
400 PX = XS + CX - X1: PY =
  YS - CX - X1: GOSUB 500
410 PX = XS + CX + X1: PY = YS
  + CX + X1: GOSUB 500
420 PX = XS - CX + X1: PY = YS
  - CX + X1: GOSUB 500
430 PX = XS - CX - X1: PY = YS
  - CX - X1: GOSUB 500
440 PX = XS + CX - X1: PY = YS
  + CX - X1: GOSUB 500
450 PX = XS - CX + X1: PY = YS
  + CX + X1: GOSUB 500
460 PX = XS + CX + X1: PY = YS
  - CX + X1: GOSUB 500
470 NEXT
480 RETURN
490 REM put one square on screen
500 PUT (5*PX, 5*PY), SP: PSET
510 RETURN
520 SCREEN 1: DRAW "BM0, 0":
  DRAW "C1"
530 DRAW "f5": DRAW "Bu511":
  DRAW "g5"
535 DRAW "br3": DRAW "u5"
540 DRAW "br3": DRAW "u5"
550 GET(0,0) - (4,4), SP
560 CLS: RETURN
```

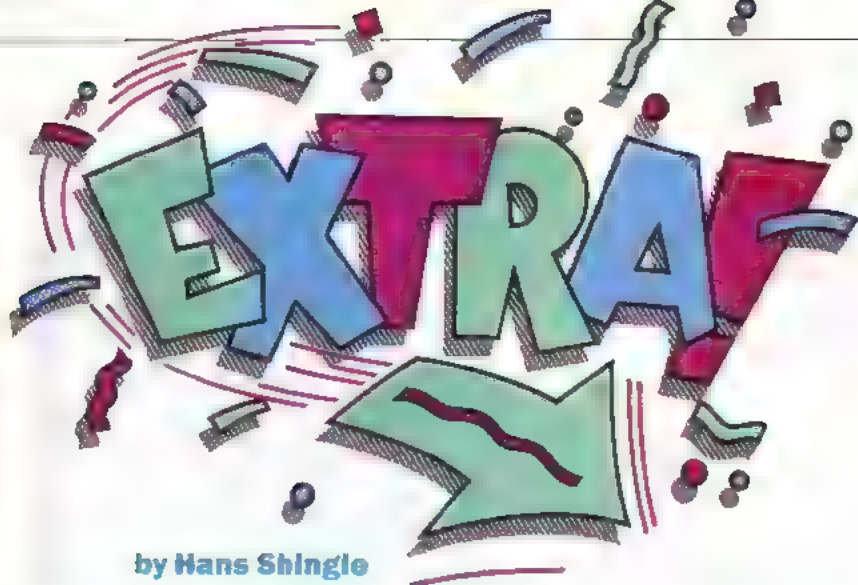
SEND US YOUR PROGRAMS

If you've written a program you'd like us to print, send it in. If we like it, we'll print it and send you \$25. Include a note telling us your name, address, age, T-shirt size and type of computer.

All programs must be your own original work. We cannot return programs. Please do not send discs.

Send your programs to:





by Hans Shingle

B R R R R !

There's a flea in Santa's beard. But the flea wants to get out of it before Santa goes into the icy Arctic night. Can you help this flea flee?

Answer on the Did It page.

ALL I WANT IS...

The Hanson kids have been good little boys and girls this year. So they're going to get the presents they want. Can you arrange it so that each kid gets the perfect gift?

Read what each of the Hansons has to say and choose from the presents below.

Answer on the Did It page.

I want something silver.

I want something I can play with on the ice.

My present has to have wheels.

SETH

ELOISE

I want my present to be bigger than Ethan's present.

ETHAN

BEANY









REBUS CAROLS



We've hidden the names of five holiday songs in a code. Can you guess the titles of all five songs? Sound out the letters and the pictures to solve them. Then turn to the Did It page for the answer.

JIN +  + S

RU +  + F the R + 

 + D  + 

S +  + A  is

COM +  + NG 2  + N

FROS +  the 

 the  + S

BAHI HUMBUG!

Mrs. Hornetloaf hates the holiday season. That's because it's so full of things that she dislikes, such as gifts and good cheer. How many of those unwanted items can you find in this word search?

Words go up, down, backwards, across and diagonally. Use our word list for help. The leftover letters will spell one winter holiday item that Mrs. Hornetloaf doesn't really mind.

Answer on the Did It page.

Joy
Fun
Songs
Gifts
Food
Snow
Turkey
Candy

Menorahs
Reindeer
Elves
Pudding

Candles
Trees
Cake

Chestnuts
Bells
Toys



C	G	I	F	T	S	E	K	A	C
S	H	D	O	O	F	S	N	O	W
S	T	E	S	J	O	Y	O	C	R
H	P	C	S	E	S	E	V	L	E
A	U	A	T	T	E	K	K	B	E
R	D	N	O	F	N	R	I	E	D
O	D	D	Y	U	N	U	T	L	N
N	I	L	S	N	G	T	T	L	I
E	N	E	S	O	N	G	S	S	E
M	G	S	Y	D	N	A	C	S	R

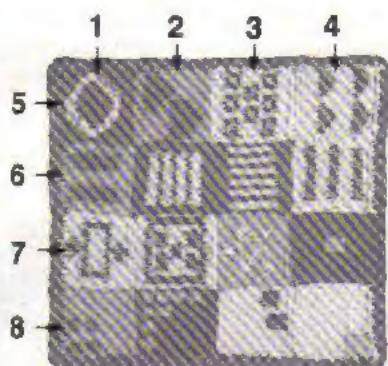
ILLUSTRATIONS BY RICHARD WESS

Did it

WRAPPER'S DELIGHT

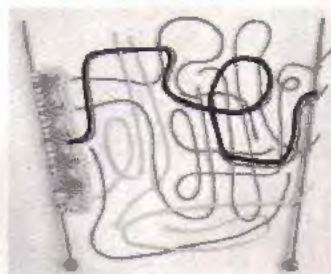
These colors repeat: Red-green-red-yellow-blue.

AFGHAN WITH A PLAN



- 1) 1 shape, 2 shapes, 3 shapes, 4 shapes.
- 2) 2 shapes, 4 shapes, 6 shapes, 8 shapes.
- 3) 8 shapes, 6 shapes, 4 shapes, 2 shapes.
- 4) 4 shapes, 3 shapes, 2 shapes, 1 shape.
- 5) Hollow shapes, solid shapes, hollow shapes, solid shapes.
- 6) Horizontal, vertical, horizontal, vertical.
- 7) Shape outside another shape, shapes inside another shape, shapes outside, shapes inside.
- 8) The shapes move clockwise: in the bottom left corner, then the top left corner, the top right corner, then the bottom right corner.

TWISTED



ALL I WANT IS...

Eloise gets the hockey stick.
Seth gets the tin foil.
Ethan gets the airplane.
Beany gets the truck.

REBUS CAROLS

- ✕ Jingle Bells, Rudolf the Red-Nosed Reindeer,
- ✖ Santa Claus is Coming to Town, Frosty the,
- ✖ Snowman, Deck the Halls

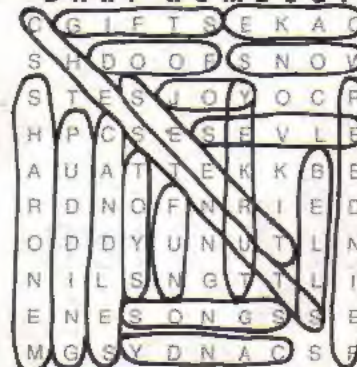
TRICK DACY

- ✖ Big Deal is hiding out at the train station.

BRRRI



BAHI HUMBUGI



Answer: STOCKINGS

NEXT MONTH

- ✖ Looking for a great way to start off 1991? How
- ★ about with the January/February issue of
- ✖ CONTACT? Here are some of the things
- ✖ you'll find:

DIG IT

- ✓ What's it like to spend hours in the hot Mexican
- ✖ sun digging for old bones? Get the dirt in this
- ✖ story!

WHAT'S UP IN SPACE?

- ✖ Where is the U.S. planning to go next in space?
- ✖ Our photo feature will give you the picture.

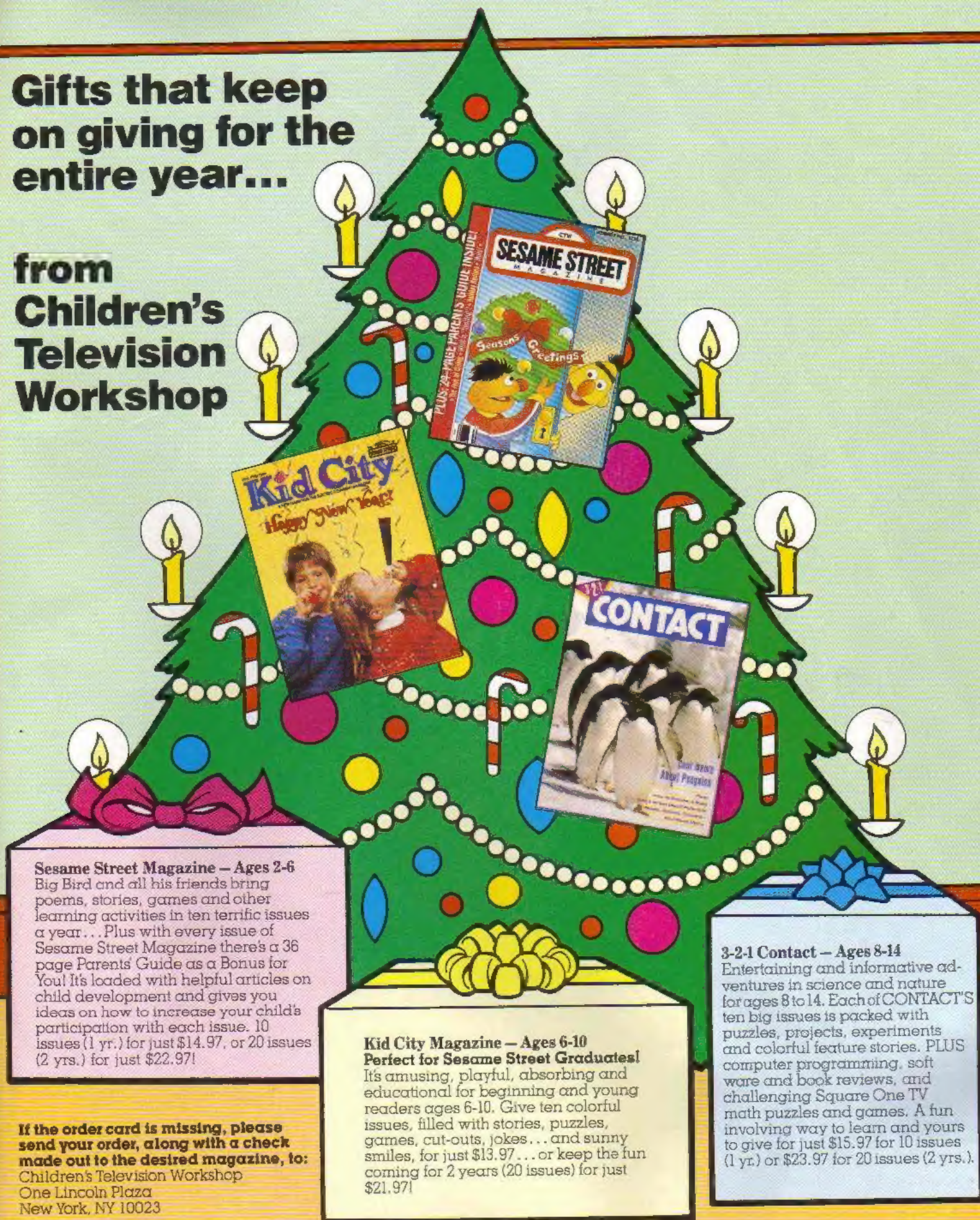
ANIMALS MAKE A COMEBACK

- ✖ Dedicated scientists and animal lovers are
- ✖ helping endangered species to survive. For the
- ✖ inside info, check out this story.

HOLIDAY FUN

**Gifts that keep
on giving for the
entire year...**

**from
Children's
Television
Workshop**



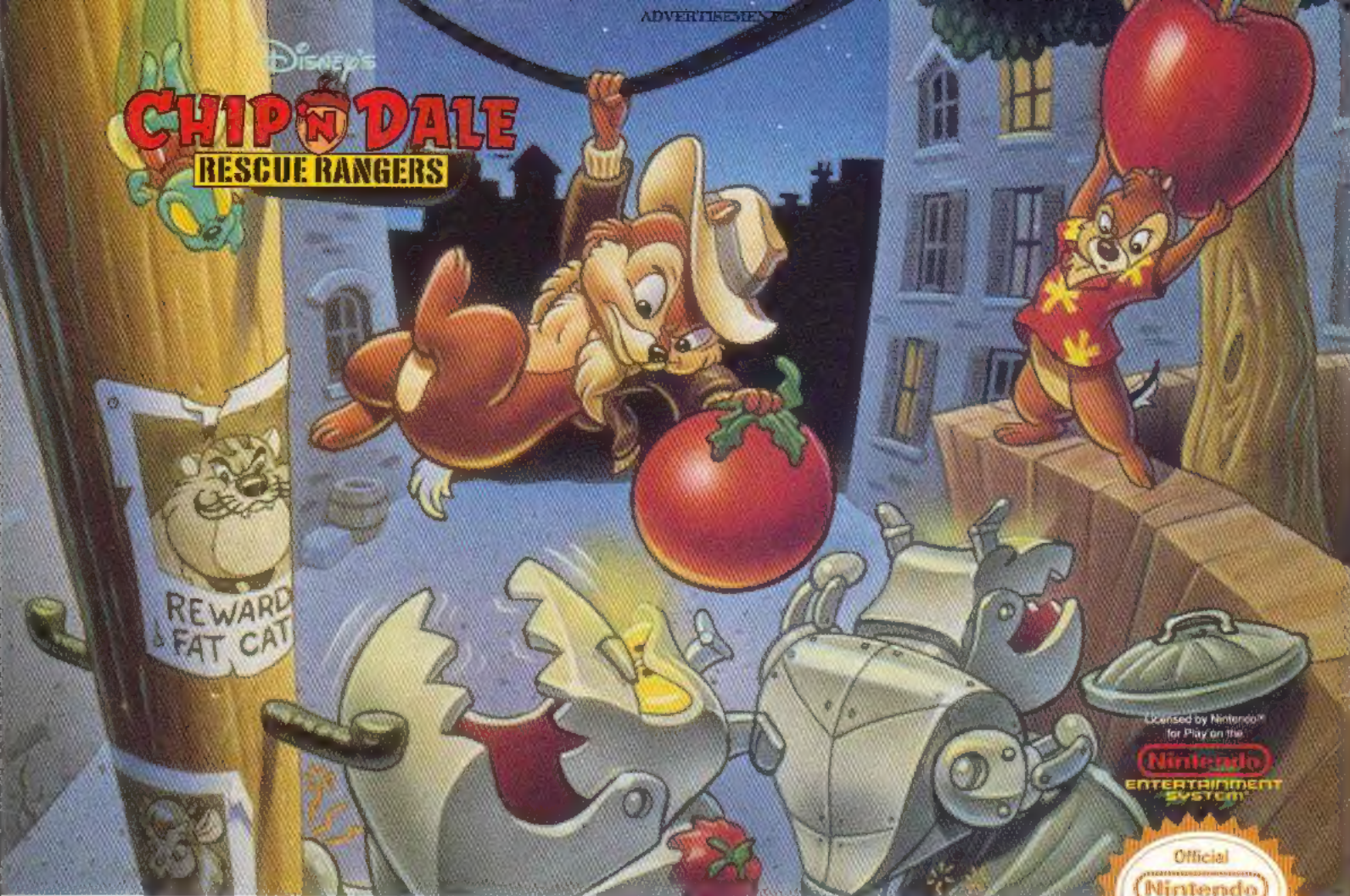
Sesame Street Magazine – Ages 2-6
Big Bird and all his friends bring poems, stories, games and other learning activities in ten terrific issues a year... Plus with every issue of Sesame Street Magazine there's a 36 page Parents' Guide as a Bonus for You! It's loaded with helpful articles on child development and gives you ideas on how to increase your child's participation with each issue. 10 issues (1 yr.) for just \$14.97, or 20 issues (2 yrs.) for just \$22.97!

Kid City Magazine – Ages 6-10
Perfect for Sesame Street Graduates!
It's amusing, playful, absorbing and educational for beginning and young readers ages 6-10. Give ten colorful issues, filled with stories, puzzles, games, cut-outs, jokes... and sunny smiles, for just \$13.97... or keep the fun coming for 2 years (20 issues) for just \$21.97!

3-2-1 Contact – Ages 8-14
Entertaining and informative adventures in science and nature for ages 8 to 14. Each of CONTACT'S ten big issues is packed with puzzles, projects, experiments and colorful feature stories. PLUS computer programming, software and book reviews, and challenging Square One TV math puzzles and games. A fun involving way to learn and yours to give for just \$15.97 for 10 issues (1 yr.) or \$23.97 for 20 issues (2 yrs.).

If the order card is missing, please send your order, along with a check made out to the desired magazine, to:
Children's Television Workshop
One Lincoln Plaza
New York, NY 10023

Disney's
CHIP 'N DALE
RESCUE RANGERS



Licensed by Nintendo®
for Play on the
Nintendo
ENTERTAINMENT
SYSTEM™



HANG TOUGH! BE A RESCUE RANGER.

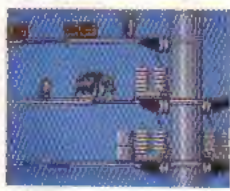


Join Chip 'n Dale's RESCUE RANGERS to thwart Fat Cat's evil attempt to take control of the city.

Chip 'n Dale, those pint sized

but courageous Disney Detectives, have received another desperate call for help.

The evil Fat Cat has kidnapped their friend Gadget.. his sinister goal- to



use her inventions to take over the city!

Journey from the darkest depths of the slimy sewers to the electrifying heights of live telephone wires! Defend yourself against Fat Cat's army of henchmen and robotic creations.



Many challenges lie ahead of you- avoid mechanical dogs, hawk bombers and killer bees. Play alone or with a friend to locate Fat Cat's headquarters and thwart his diabolical scheme!



• The search is on in this exciting family entertainment game from Capcom.

• For 1 to 2 players.

• Join

Monterey Jack, Zipper, and Gadget in this action-packed adventure!



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